ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE ENGINEERING AND TECHNOLOGY

RISK ASSESSMENT AND ALTERNATIVE DISPUTE RESOLUTION PRACTICE: TRANSPORTATION INFRASTRUCTURE PROJECTS

M.Sc. THESIS

Furkan ÖZBEY

Department of Civil Engineering

Transportation Engineering Programme

MAY 2015

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İSTANBUL TEKNİK ÜNİVERSİTESİ ★ FEN BİLİMLERİ ENSTİTÜSÜ

ULAŞIM ALTYAPI PROJELERİNDE RİSK DEĞERLENDİRMESİ VE ALTERNATİF UYUŞMAZLIK ÇÖZÜM UYGULAMALARI

YÜKSEK LİSANS TEZİ

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Furkan-Özbey, a **M.Sc.** student of ITU **Graduate School of Science and Technology** student ID 501111435, successfully defended the **thesis** entitled "**RISK ASSESSMENT AND ALTERNATIVE DISPUTE RESOLUTION PRACTICE: TRANSPORTATION INFRASTRUCTURE PROJECTS**", which he prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

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Date of Submission : 04 May 2015
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To my family,

FOREWORD

I would like to thank to my advisor Dr. Nurbanu Çalışkan to accept to be my thesis advisor and Asst. Prof Dr. Pelin Alpkökin to spare her valuable time, to help to find valuable resources and for all help to complete the thesis. Moreover, I would like to thank Mr. Ali Osman Baki who works in General Directorate of Highways, provided a great help to access infrastructure companies to fill the questionnaire. Finally, I would like to thank my father to push me to study Master of Science and my family to support me at all time during my education.

May 2015

FurkanÖZBEY
(Civil Engineer)

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ABBREVIATIONS

ADR **:** Alternative Dispute Resolution
AIA **:**American Institute of Architects
BOT **:** Build Operate Transfer
CCG **:**Construction Conciliation Group
CDB **:** Combined Dispute Board
CSP **:** Court Settlement Procedure
DAB **:** Dispute Adjudication Board
DB **:** Dispute Boards
DBO **:** Design Build Operate
DRB **:** Dispute Resolution Boards
EPC **:** Engineering Procurement Construction
FIDIC **:** Federation Internationale Des Ingenieurs Conseils
ICC **:** International Chamber of Commerce
ICE **:** Institution of Civil Engineers
ITH **:** Inuvik to Tuktoyakhuk Highway
MDB **:** Multilateral Development Banks
NAFTA **:**North American Free Trade Agreement
NEC **:**New Engineering Contract
NFF **:** Neutral Fact Finding
MRT **:** Mass Rapid Transit
PPL **:** Public Procurement Law
PPP **:**Public Pricate Partnership

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RISK ASSESSMENT AND ALTERNATIVE DISPUTE RESOLUTION PRACTICES: TRANSPORTATION INFRASTRUCTURE PROJECTS

SUMMARY

Construction process of a project has a caotic relations structure, which composes of various amounts of inputs. This complexity contains many uncertainties and risks. When those risks occur, disputes may arise.

The purpose of the theis is to assess transport infrastructure project risks and analyze the effects of alternative dispute resolution practices on those risks. Accordingly, thesis will be composed of;

- Construction Risks
- Contract Types
- Examination of dispute resolution practices
- Preparation and analyze of risk matrix for transport infrastructure projects

Construction industry is a risky industry. To be able to asses those risks a Risk Management concept is developed. Risk management deals risk with;

- Risk identification
- Risk assessment and analysis
- Risk response

However, Turkish companies still use their information and experience rather than a professional risk management. However, they try to prevent them from risk; risk in construction industry cannot be depleted. In the thesis, construction project risks and their sources have been investigated.

Construction projects are exposed to;

- Political risks
- Economical and financial risks
- Cultural risks
- Design risks
- Site risks
- Construction risks
- Environmental risks
- Subcontractor and supplier risk

Chapter 3 explains contract types in construction projects. The most popular contract type FIDIC and Turkish Public Procurement Law is defined and explained.

Dispute resolution methods are introduced in construction projects in chapter 4 which are;

- Litigation
- Arbitration
- Dispute Resolution/Adjudication Board

- Adjudication
- Expert Fact-Finding
- Executive Tribunal
- Mediation
- Negotiation

Plusses and minusses of those methods are assessed. Except litigation and arbitration, they all are part of Alternative Dispute Resolution (ADR) methods. ADR operating mechanism is explained. Instead of courts, ADR provides experts to settle the dispute. ADR can offer flexibilities to the parties if requested. Moreover, ADR can settle the issue much faster and cheaper.

In chapter 5, infrastructural transport projcet risks have investigated with a literature research study. Highway, railway, tunnel and bridge project risks have investigated.

In chapter 6, a risk matrix is composed from the research fromchapter 5. A questionnaire is prepared with these risks. Respondants were composed of technical personnel in infrastructure transport projects and has knowledge about risks and contracts about projects. Questionnaire composed of two parts. In the first part, respondants were asked probability of occurrence of risks, impacts when it occurs and ADR effect to settle the dispute of that risk. In second part, dispute resolution methods are asked and reasons to use or not to use ADR in case of a dispute is asked.

In the second part of chapter 6, the questionnaire results had evaluated with risk rating method.

Second part of the questionnaire showed that, litigation and arbitration are used more than ADR in transport infrastructure projects. The reason of this issue is lack of knowledge and effect of ADR in case of a dispute. The companies that used ADR have satisfied and indicated to use ADR in another dispute arises.

ULAŞIM ALTYAPI PROJELERİNDE RİSK DEĞERLENDİRMESİ VE ALTERNATİF UYUŞMAZLIK ÇÖZÜM UYGULAMALARI

ÖZET

İnşaat yapım süreci, bir çok girdinin olduğu kaotik bir yapıdadır. Bu karmaşıklık pek çok belirsizlikleri ve riskleri barındırmaktadır. Bu risklerin vuku bulmalarıyla da uyuşmazlıklar oluşmaktadır.

Bu çalışmanın amacı ulaştırma altyapıları projelerinde oluşan risklerin değerlendirilmeleri ve alternatif uyuşmazlık çözüm kurullarının bu riskler üzerindeki etkilerinin incelenmesinden oluşmaktadır. Bu doğrultuda tez;

- İnşaat Riskleri
- Kontrat tipleri
- Uyuşmazlık çözüm metotlarının incelenmesi
- Ulaştırma projeleri için risk matrisinin oluşturulması ve incelenmesinden oluşmaktadır.

İnşaat sektörü riskli bir sektördür. Bu risklerle başa çıkabilmek için ise risk yönetimi diye bir kavram geliştirilmiştir. Risk yönetimi;

- Risk tanımlama
- Risk değerlendirme ve analizi
- Riske karşı tepki bölümleriyle risklerle başa çıkmaktadırlar.

Ancak, yapılan mülakatlarda görüldüğü üzere, Türk şirketlerinin genel olarak henüz bu konuda risk yönetimi gibi uzmanlıkların yerine, bilgi ve deneyimle risklerle başa çıkmaya çalıştıkları görülmüştür. Her ne şekilde önlenmeye çalışılırsa çalışılsın, inşaat sektörü risk bakımından oldukça zengindir ve her ne kadar önlem alınsa dahi bazı riskler vuku bulacaktır. Tezde, ulaştırma altyapı inşaat riskleri araştırılmış ve kaynakları incelenmiştir.

İnşaat projeleri;

- Politik Riskler,
- Ekonomik ve Finansal Riskler,
- Kültürel Riskler,
- Dizayn riskleri,
- İnşaat Sahası Riskleri,
- Şantiye Riskleri,
- Çevresel Riskler,
- Taşeron ve Tedarikçi Riskleri

gibi bir çok riskleri içerisinde barındırmaktadır. Politik risklere; savaşlar, güç dengelerinin değişimi, toplumsal kargaşa, yapılan yolsuzluklar ve projenin bulunduğu ülkenin komşu ülkelerle ilişkileri sayılabilir. Ekonomik ve finansal riskler bir projenin başarısı için büyük öneme sahiptir ve işçi ve malzeme fiyatlarındaki dalgalanmalar, kur hareketleri, enflasyon, devalüasyon ve işverenin ödemelerdeki yaptığı aksaklıklar bu riskleri oluşturur. Kültürel risklere ise düşük verimlilik, dil engeli, farklı yaşam tarzları örnek verilebilir. Dizayn riskleri inşaat projeleri için çok

önemlidir ve projeye direkt etki eder. Planlardaki değişiklikler, işlerin kapsamlarındaki değişiklikler gibi dizayn sürecinde ve inşaat sürecinde yaşanan dizayn problemleri bu başlık altında toplanır. İnşaat sahası riskleri ise kamulaştırma problemleri, yerleri değiştirilmiş boru hatları, sahaya ulaşım gibi riskleri belirtir. Şantiye riskleri, inşaat süresince oluşan riskleri belirtir. Zemin şartlarının tahmin edilememesi altyapı projeleri için önemli bir risk kaynağıdır. Ayrıca, herhangi bir sebepten oluşan gecikmeler, değişen çizimler, iş güvenliği gibi konular da şantiye riskleri arasında tanımlanır. Kötü hava koşulları ve mücbir sebepler de çevresel riskler arasında gösterilebilir. Son olarak, taşeron ve tedarikçi riskleri olarak da malzeme tedariğinde yaşanan gecikmeler ve kalitesiz işçilik gösterilebilir.

Tezin 3. Bölümünde inşaat projelerinde kullanılan kontrat tipleri belirtildi. En sık kullanılan uluslararası kontrat tipi FIDIC ve ülkemizde kullanılan Kamu İhale Sözleşmeleri Kanunu anlatıldı ve incelendi.

4. bölümde inşaat projelerinde kullanılan uyuşmazlık çözüm yöntemleri araştırıldı. İncelenen yöntemler:

- Mahkemeler
- Tahkim
- Uyuşmazlık çözüm kurulları
- Sözleşme hakemliği
- Bilirkişi değerlendirmesi
- İdari Kurullar
- Ara-buluculuk
- Müzakere

Bu sistemlerin artıları ve eksileri değerlendirildi. Bunlardan ilk ikisi klasik uyuşmazlık çözüm yöntemi olarak değerlendirildi. Geriye kalanlar ise Alternatif Uyuşmazlık Çözüm yöntemi olarak değerlendirildi. Alternatif uyuşmazlık çözüm sistemlerinin çalışma mekanizmaları anlatıldı. Mahkemelerin aksine konularında uzman kişilerden oluştukları uyuşmazlık sürecinin tarafların isteklerine bağlı olarak çeşitli esneklikler içerebildikleri belirtildi. Ayrıca süre ve finansal açıdan da klasik uyuşmazlık çözüm yöntemlerine göre daha avantajlı olduklarından bahsedildi.

Diğer bölümde ulaştırma altyapı projelerinin karşılaştıkları riskler araştırıldı. Karayolu, demiryolu, tünel ve köprü projelerinde karşılaşılan riskler literatürlerden araştırıldı.

6. bölümde ise araştırılan bu risklerle risk matrisi oluşturuldu. Hazırlanan anket risk değerlendirmesi ve uyuşmazlık çözümü olmak üzere iki kısımdan oluşmaktaydı. Hazırlanan anket ulaşım altyapı projelerinde çalışan veya o firmalara müşavirlik hizmetleri sunan, alanlarında tecrübeli kişilere doldurtuldu. Anketin ilk bölümünde kişilerden risklerin oluşma olasılıkları, oluşan riskin etkisi ve alternatif uyuşmazlık çözüm kurullarının bu riskleri çözümündeki etkileri bölümlerinin doldurulmaları istendi. İkinci bölümünde ise uyuşmazlık çözüm metotlarının değerlendirmeleri ve alternatif uyuşmazlık çözüm yollarının uyuşmazlık çözümünde tercih edilmelerinin veya edilmemelerinin nedenleri sorulmuştu.

6. Bölümün ikinci kısmında doldurulan anketin verileri proje risk değerlendirmesi metoduyla değerlendirildi. Bu değerlere göre ulaştırma projeleri;

- Geoteknik olarak eksik ve hatalı bilgilerden
- Kamulaştırma gecikmelerinden oluşan problemler
- Yerleri değiştirilmiş kentsel su, elektrik ve kanalizasyon hatları

- Üçüncü taraflar yüzünden oluşan gecikmeler
- İnşaat safhasında işin kapsamının değişmesi
- Projenin politik baskılar yüzünden daha çabuk bitirilmesinin istenmesi
- Ödemelerdeki gecikmeler
- Devletin onay mercilerindeki gecikmeler

ulaştırma altyapı projelerinin en önemli riskleri olmuşlardır.

Anketin ikinci bölümünde sorulan sorularda da görülmüştür ki; ulaştırma projelerinde taraflar aralarındaki anlaşmazlıklarda Alternatif uyuşmazlık çözümlerine nazaran klasik yöntemleri daha sıklıkla kullanmaktadırlar. Bu durumun temel sebebi, Alternatif çözüm kurullarının kullanımlarının ve etkilerinin firmalardaki bu kurullar hakkındaki bilgi eksiklikleri olduğu görülmüştür. Bu yöntemleri kullanan firmalar yöntemlerden memnun kalmış ve ileride de oluşabilecek uyuşmazlık çözümlerinde alternatif çözüm kurullarını tercih edeceklerini belirtmişlerdir.

1 INTRODUCTION

Every construction project is unique in respect of its location, production technique, used materials, standards that are considered, cultural background and perspective of people who worked. Those uncertainties cause vulnerabilities and risks in construction projects.

Nevertheless, transportation infrastructure construction is leading industry in developing countries. Thriving economy and technology enable to increase in construction investments whether they are national or international, enforced corporations, governments or individuals. Besides, international agreements like Uruguay Round in General Agreement Tariffs and Trade and North American Free Trade Agreement (NAFTA) increase the willingness of construction companies to expand their business into international markets (Bu-Qammaz, Dikmen, & Birgönül, 2009).

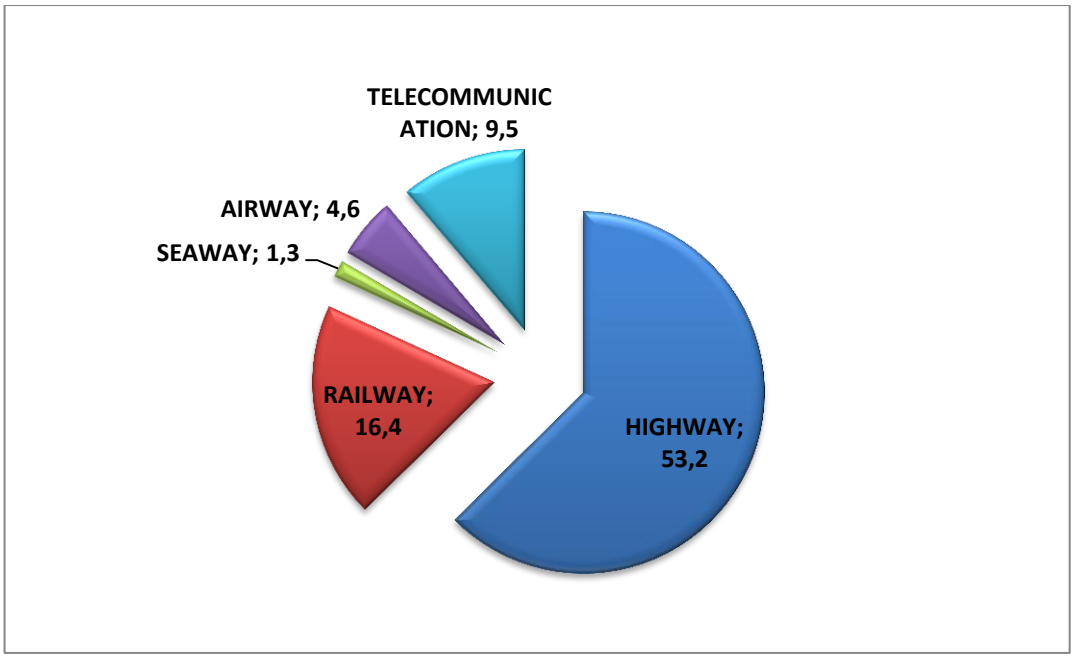

Figure 1.1 : Infrastructure investments in Turkey between 2003-2015 (billion $)

Turkey has invested 85 billion US Dollars to transportation infrastructure projects since 2003 which can be seen in the Figure 1.1 above. 53,2 billion US Dollars has spent to highway, 16,4 billion Dollars railway. Another developing country Qatar planned to spent 150 billion US Dollars for transportation projects until 2030. Until 2015, they have spent nearly 80 Billion US Dollars and remaining amount distribution can be seen in the figure 1.2.

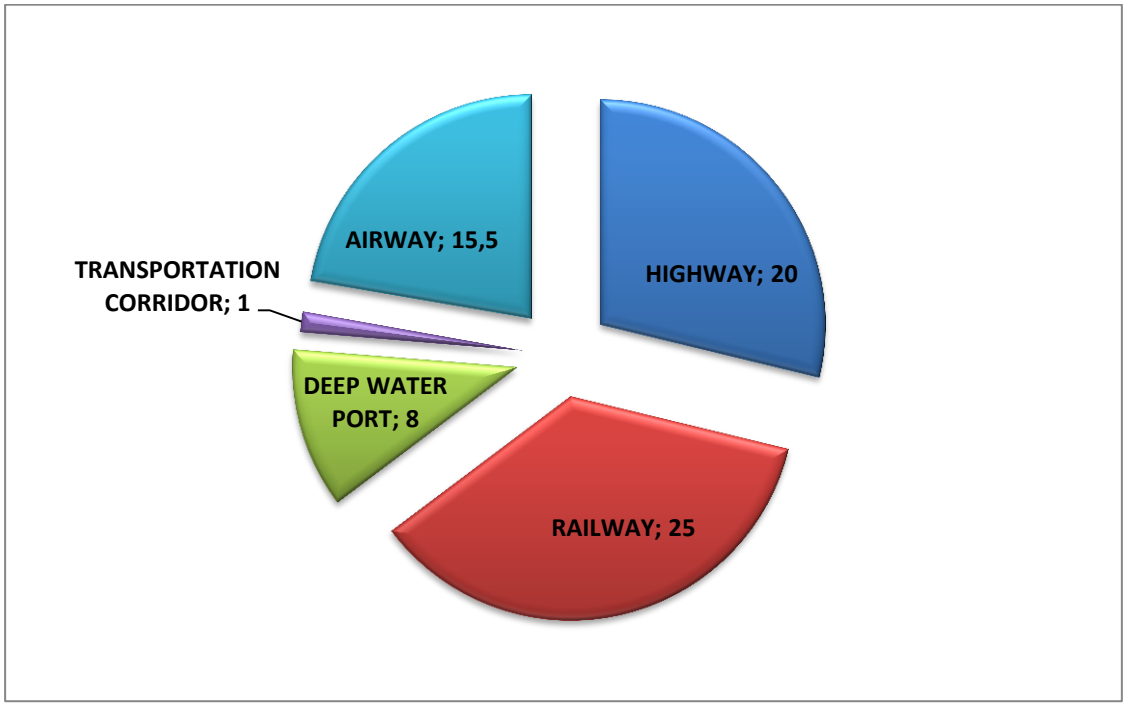

Figure 1.2 : Infrastructure investments in Qatar between 2015-2030 (Billion $)

Construction is risky business. The companies that work overseas are exposed to external risks such as political risks, cultural risks, social risks and environmental risks in addition to project risks. Therefore, due to project level, country level and global level risk; risk management practices have crucial importance in construction projects (Fidan, 2008).

Risk is defined in Business Dictionary as "the probability that an actual return on an investment will be lower than the expected return". PMBoK (2000) defines risk as an uncertain event or condition that may have a positive or negative effect on project objectives. Even though a risk may be positive or negative, studies of risk in construction industry usually considers the negative risks. Researchers presented

some steps for risk management system to be able to deal with them. In this thesis, these are risk identification, risk assessment-analysis and risk response.

In a construction project, there are different kinds of contracts such as construction contract, service contract or loan contract to arrange the relationship between parties. Construction contract is the one that related with the construction of the project, which set the rights of the relationship between owner and contractor (Korkmaz). Construction contracts define the responsibilities and share risks between owner and the contractor.

Size and complexity of the project investments increased with developing economy and technology as mentioned. Construction industry has many variables and uncertainties. Therefore, increasing investments demanded more detailed professional contracts that could define responsibilities and boundaries between parties and share the risks righteously.

To be able to respond the need, organizations prepared standard forms of contracts. American Institute of Architects (AIA) published its first standard general conditions of construction "Standard Documents of AIA" in 1911. One of the most famous FIDIC, an organization which is prominent about construction contracting, is founded 1913 in Belgium. Nowadays, it has more than 90 member countries. FIDIC publishes different types of construction contracts according to needs of the industry. The organization published its first contract type which name was Red Book" in 1957. Moreover, in United Kingdom, New Engineering Contract (NEC) prepared its first contract in 1993 and NEC3 contract suite 2005.

Even though significant amount of work is done on construction contracts, dispute among the parties cannot be prevented. Lack of information, project changes, contractual vagueness and uniqueness of every construction are some reasons of these problems. Construction risks and therefore, claims and disputes between parties are unavoidable phenomenon. That is why; preparing contract types for the projects was not enough for deciding every issue.

At first, courts were resolving the disputes. However, it was taking too much time and money. Furthermore, courts were resolving disputes in absolute win-lose system. In this system, one party wins the other loses. However, a construction dispute problem was more complex than absoluteness. Because of those kinds of problems,

Alternative Dispute Resolution (ADR) methods are investigated. FIDIC first suggested “the Engineer”. It was supposed to act neutral at the time of dispute. However, since the engineer is owner’s personnel, it was create prejudice and distrust. Therefore, FIDIC established Dispute Adjudication Board (DAB) to settle the disputes effectively before parties go to courts. This board usually consists of three members for each project. The members are mostly chosen from engineers instead of lawyers. Moreover, aside from DAB; Dispute Resolution Boards, mediation, negotiation etc. are started to use as ADR for dispute resolution.

In this thesis, construction risks will be researched, defined and investigated generally in chapter two. After that, in chapter three; FIDIC construction contracts and Turkish Public Procurement Law will be defined. Chapter four will introduce Alternative Dispute Resolution Methods. Effect of dispute adjudication types, which are arbitration, mediation, and conciliation and dispute boards, in an infrastructural construction project will be viewed. Risk matrix is going to be prepared for infrastructural construction project in chapter six. A questionnaire will be prepared about the risks and the effect of dispute boards to adjudicate those risks. Contractors and consultants who have work experience in international projects will fill this questionnaire. Risk perspective of infrastructure project and dispute adjudicators affect from the contractors’ and consultants’ point of view will be discussed with questionnaires.

2 CONSTRUCTION RISK

Risk is inevitable daily issue in our life. Individuals usually do not even think about it. Driving, cooking even sleeping contains risks.

Construction industry considered as risky industry. The reason is; it composes diverse area of specialties and every structure is designed as unique. Therefore, even technical personnel try to calculate and eliminate every possible risk that will happen during construction, they may not be able to cover all risks at the contractual stage. It does not matter how much they are experienced. This is because risks are interconnected to every aspect from political to health and safety.

In this chapter of thesis, literature review of risk assessment and management in international construction business will be covered.

2.1 Literature Review on Risk

Construction industry focuses on the negative risks for risk assessment and usually neglects the positive risk. To begin with, "*Risk*" is defined in Oxford dictionary as "*a situation involving exposure to danger*". Its synonyms are shown as chance, uncertainty, unpredictability, precariousness, instability and insecurity (The Oxford English Dictionary). If the Business Dictionary has been checked to find out the meaning of risk in finance; the definition will be "*The probability that an actual return on an investment will be lower than the expected return*". Also, the dictionary categorizes risks as; "*Basic risk, Capital risk, Country risk, Default risk, Delivery risk, Economic risk, Exchange rate risk, Interest rate risk, Liquidity risk, Operations risk, Payment system risk, Political risk, Refinancing risk, Reinvestment risk, Settlement risk, Sovereign risk, and Underwriting risk*" (Business Dictionary, 2014).

Zhi defines construction projects as risky projects. If the project is abroad, risk increases significantly. According to him; the reason is *"lack of adequate overseas information and overseas construction experience"*. Risks characteristics change in different regions and therefore, even same buildings may have different risk

characteristics. In his article, Zhi suggests risk management approach which has four stages:

a- Risk Classification

b- Risk Identification

c- Risk Assessment

d- Risk Response

Zhi also introduces a hierarchical risk classification structure for overseas construction projects shown in figure 1.

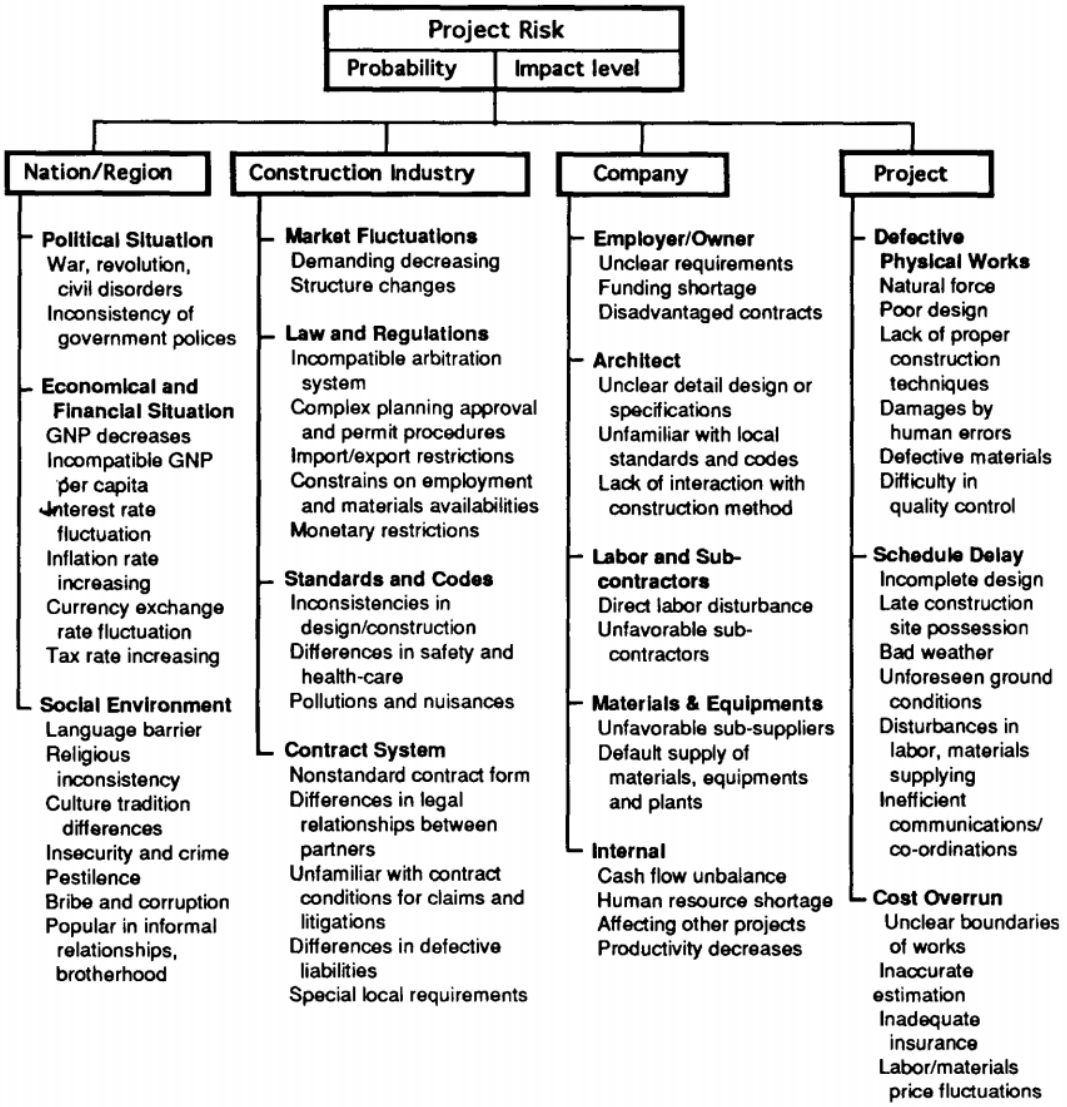

Figure 2.1 : Zhi's hierarchical risk classification structure

Chua Et al focused to identify the key factors and extent of cost growth exposures from tendering to construction in their article (Chua, Wang, & Tan, 2003). In the article, main problems for the foreign contractors are the differences of the practices and perception. Therefore, cost of the projects increase considerably.

Han and Diekmann introduce an approach for international market entry decisions. They propose a structure of risk (figure 2) and then formalizing a go/no-go model (Han & Diekmann, 2001).

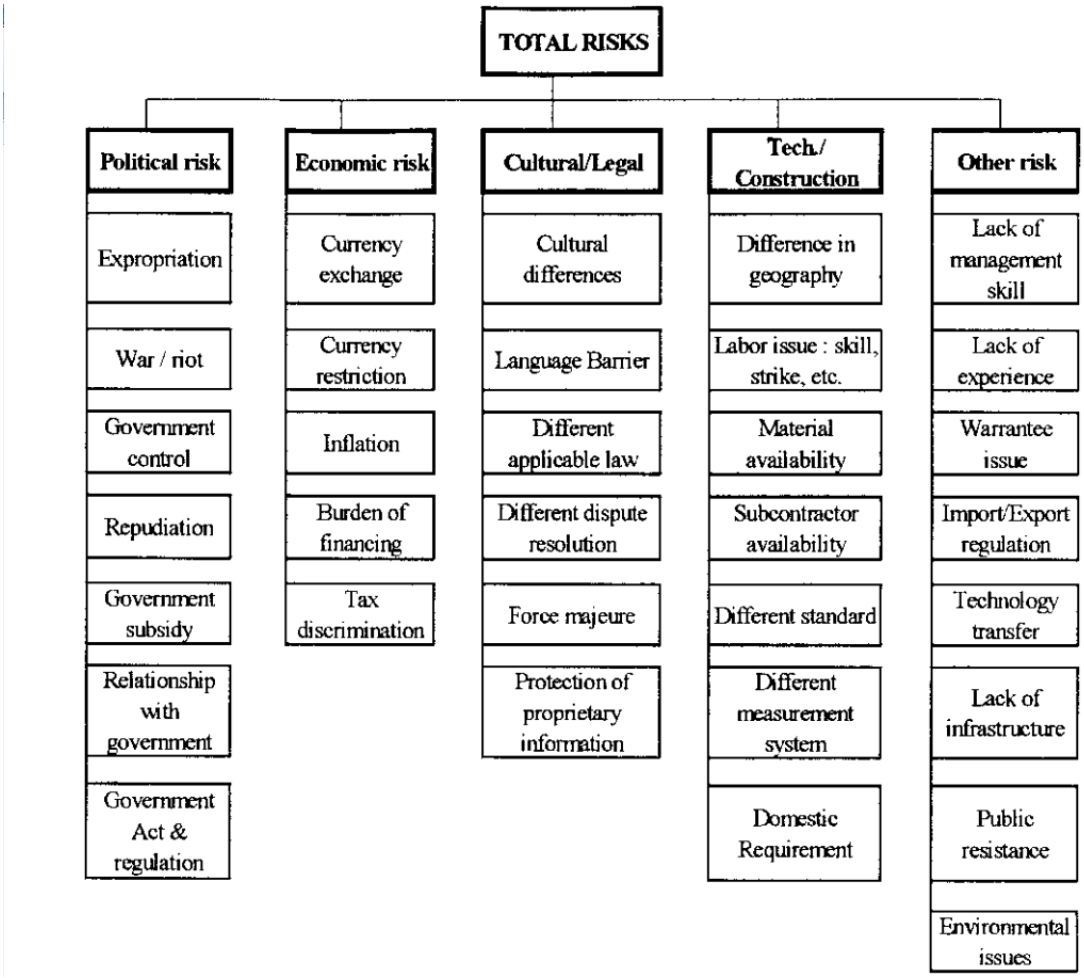

Figure 2.2 : Breakdown structure of risks Hann and Diekmann

"Risk assessment in BOT road projects" article is written by Pathon and Pimplikar. The article investigates the reasons of large scale road projects which are constructed by using public private partnership.

Pathon and Pimplikar's article investigate usage of Public Private Partnership (PPP) in Road Projects in India. According to their article, they suggest BOT in road construction because; road construction creates financial and labor stress on the

government bodies if the road is constructed by them. However; private company services are more efficient, they deliver better money propositions and risk is shared between government and contractors. The main objective of the paper is financial risks in BOT; in post construction period, operation and maintenance period due to change in interest rates (Pathan & Pimplikar, 2013).

Lichitruangsilp and Ioannou have an article named "Risk Allocation in Standard Forms of General Conditions for Tunneling Contracts. Tunnel construction is one of the most complex, large scale and expensive infrastructure type that contains important risks in project life. Underground construction works increases the unknown. A primary source of risk in underground work is geologic uncertainty. Therefore, tunneling contracts entail understanding of tolerance of risks by contractor and employer. The contracts contain the identification of tunneling risks and determinations of the most feasible and reasonable respond to them. However, tunneling contracts are only adaptation of standard forms of general conditions since there is no specific contract type for tunnel construction. Thus, this may lead to some claims and disputes. The paper defines tunneling risk factors and categorizes them and shows some case studies (Likhitruangsilp & Ioannou, 2009).

Owners are tended to transfer uncertainties and liabilities to the contractors in order to reduce their project risks. However, this situation leads to significant cost increase and also it may lead to unfair risk distribution in complex projects. Tsai and Yen investigate risk allocation with a case study on Taiwan high speed railroad project. Project composes of three parties which are owner, construction contractor and core system contractor. Tsai and Yen tries to identify the risks between core system and construction contractors, and compare contract clauses of contract books from the point of risk factors. (Tsai & Yen, 2006)

2.2 Construction Risk Management

When a risk is exposed and identified, it is not considered as a risk anymore. From that time on, it is considered as a risk management problem. Risk management aims to ensure the project is completed in every aspect (Uğur, 2006). Perera et al describes the risk management as a procedure of controlling the level of risks and mitigating the effects. Risk management procedures are identified in variable steps in the articles. Risk identification, risk analysis, and risk handling/risk response are

considered as key steps among the risk definitions (Perera, Dhanasinghe, & Rameezdeen, 2009).

2.2.1 Risk identification

First step of risk management process is defined as "*Risk Identification*" in the articles which are written by Zayed et al, Perera et al and Pipattanapiwong. This step is a key step to identify and detect the sources of risks and their potential effects (Perera, Dhanasinghe, & Rameezdeen, 2009). Pipattanapiwong suggest that risk identification process should start to be performed in appraisal of the project. During the project, it should be performed regularly. Risk identification process consists of project objective, risk management scope and plan and historical data related to project (Pipattanapiwong, 2004).

2.2.2 Risk assessment-analysis

The aim of risk assessment is to evaluate the risks and assess the impacts of them (Pipattanapiwong, 2004). Risk assessment estimates the probability of occurrence of the risk and severity of its impact (Zayed, Amer, & Pan, 2007). Zhi suggests a mathematical description:

$$R=P\times I$$

R is degree of risk, P is the probability which may be an undesirable event occurrence, within [0, 1] and I is the degree of impact which shows the degree of severity, within [0, 1] (Zhi, 1995).

PMBOK informs that determining the impact of the risk is a complicated issue since it contains various factors such as:

- Opportunities and threats may interact
- One risk may cause Multiple effects
- One of stakeholder's opportunity may be a threat to another
- Mathematical techniques can be delusive and can give wrong impression of precision and reliability. (Duncan, 1996)

2.2.3 Risk response

Since all risks cannot be removed, the effects of them must be limited or reduced with proper risk management. Risk response is a strategy to lessen the negative impact of risks. Risk response is categorized in different ways in different articles. Perera et al divides risk response into four main categories which are risk retention, risk reduction, risk transfer and risk avoidance. (Perera, Dhanasinghe, & Rameezdeen, 2009).

Zhi considers risk response phase as the most important in risk management. He defines risk response through three channels, which are by contract, by insurance and by risk retention management. The first two channels are for risk allocation and the last one is for risk control. Risk allocation can be made during contractual phase with subcontractors. (Zhi, 1995)

PMBoK divide risk response to three categories:

- Avoidance: Some risk may be avoided by eliminating the threats.
- Mitigation: Mitigation reduces the loss of risk source or probability of occurrence by establishing a plan.
- Acceptance: Accepting the consequences. (Duncan, 1996)

2.3 Construction Project Risks

Project risks are defined by various researchers. They all defined them according to their research but when they are investigated, it can be seen that most of them are similar even their investigated projects are different.

In this section project risks are going to be described generally. In chapter 5, infrastructural investment risks will be discussed and in chapter 6, infrastructure risk matrix will be prepared.

2.3.1 Political risks

Ashley and Bonner considered political risk as "*a highly subjective and business-specific event*" which may be a significant risk to one industry, but a low risk to another one. (Ashley & Bonner, 1987)It is defined by Haendel's definition of political risk is mentioned in many articles which is "*the risk or probability of*

occurrence of some political event(s) that will change the prospects for the profitability of a given investment". (Haendel, 1979). Ashley and Bonner wrap up the political risk definition as "*change or discontinuity in the business environment. For the purposes of this presentation political risk is defined as the occurrence of politically motivated events that affect the multinational contractor's ability to operate effectively in the host country*". (Ashley & Bonner, 1987).

International construction companies are vulnerable to the political risk since the country is unfamiliar to them (Chua, Wang, & Tan, 2003). However, the impact may not affect all construction projects in the same way. It affects the construction market or an associated market. Thus, it is important to identify the impact risk of the specific political risk to the certain project (Hastak & Shaked, 2000).

Political risks that make international construction companies distressed are defined by He Zhi (1995) as; war, revolution, civil disorder and inconsistency of government policies make the international construction companies distressed (Zhi, 1995). Additionally, Chua Et al add power group transfer, change in policies, political corruption and government interference to the risk factors. Moreover, instability and invested country's relationship with the other countries can be considered as a political risk. Moreover to those risks; Phillips adds public sector budgeting cycles, changes in law, changes in taxation and constraints on Foreign Investors after investment (Phillips, Matrix of Road Distribution, 2008).

2.3.2 Economical/financial risks

Economic risk is considered as a high risk in international construction projects. Its effect on the project may determine the success or failure (Han & Diekmann, 2001). Recession or economic crisis, fluctuation of foreign exchange rates, fluctuation of labor and material price, inflation and currency devaluation, rising tax rates, interest rates fluctuations are classified as economical risk by researchers (Chua, Wang, & Tan, 2003) (Zhi, 1995) (Likhitruangsilp & Ioannou, 2009) (Hastak & Shaked, 2000) (Han & Diekmann, 2001).

Economic slowdown of country also effects construction industry as well. It would reduce the profit range and force companies to be more competitive vulnerable to the risks (Bing, Tiong, Fan, & Chew, 1999).

Chua et al emphasize that; the impact of economic risks can be significant for construction companies. For instance, considerable payment delay from World Bank finance project led companies to failure financially since most of the local construction companies are middle sized (Chua, Wang, & Tan, 2003). Furthermore, for economical and financial risks, Phillips (2008) adds;

- Base interest rates to Financial Close
- Interest spread risk to Financial Close
- Currency fluctuations
- Inflation on Construction Costs
- Inflation on Operation, Maintenance, Rehabilitation
- Refinancing (if no 2 stage financing)
- Costs of finance on change of requirements

2.3.3 Cultural risks

International construction companies may also suffer from social and cultural risks. Oxford Dictionaries represents culture as "*ideas, customs and social behavior of a particular people or society".* Cultures vary throughout the world. According to Chua et al; cultural differences are more significant between an economical developed country and less developed country. These differences can pose crucial borders for communication between host culture and home culture (Chua, Wang, & Tan, 2003).

Overseas construction industries exposes social and cultural risks more from their workers, subcontractors, suppliers to the local government and their employers. Values which are important to one side may not be important to other side. (Günhan & Arditi, 2005).

Chua et al sorts the causes of cultural risk that are below:

- Lower labor productivity
- Lack of construction technology and skills
- Differences in management philosophy
- Lack of transparency in bidding process
- Nepotism and overvalue of relationship
- Bureaucracy in government approval system
- Negotiation instead of litigation in dispute settlement

- Language barriers (Chua, Wang, & Tan, 2003)

2.3.4 Design risks

Design phase is initial phase of a project. Any defective design cannot be underestimated because it may lead to poor performance of completed infrastructural project (Perera, Dhanasinghe, & Rameezdeen, 2009).Infrastructure projects usually composes of large area and within those area, different geological conditions are present. Moreover, tunneling projects are more exposed to geotechnical and other data inaccuracies regardless how sophisticated the site exploration may be (Likhitruangsilp & Ioannou, 2009). Experience of design team, incomplete drawings, undefined scope and frequent design changes are considered as design risk. Moreover,

- Feasibility Approvals and consents,
- Detailed design approvals and consents
- Working (Construction) drawings delay in final approval of detailed design
- Changes in design and construction standards during the construction period

are also considered as design risks.

2.3.5 Site risks

Conditions of the project area are considered as site risk. Performing a project in the city has its own sources of risk such as access corridor from local roads to worksites or land acquisition (Bu-Qammaz, Dikmen, & Birgönül, 2009). Water, air or soil pollution, ground/soil conditions, past mine workings and environmental effects such as weather are included to site risk. Moreover, undiscovered defects in existing infrastructure are also regarded as site risk (Phillips, Matrix of Road Distribution, 2008).

2.3.6 Construction risks

The risks that occur during construction phase may be regarded as construction risks. Likhitruangsilp defines them as inappropriate construction method, inappropriate construction plan, poor quality control, unsafe work and action leading to pollution (Likhitruangsilp & Ioannou, 2009). Delay in completion, land acquisition difficulties, poor quality workmanship are considered as construction risks (Lie & Zou, 2012)

2.3.7 Natural risks

Natural risk may also be called as environmental risk. These risks are one of the important reasons of project delays. The range of this risk is wide. Adverse weather is a common type of natural risk. Flood, earthquake, fire are natural risk too and they are called “act of god”. Especially, foreign companies are more vulnerable to environmental risks because of their lack of knowledge of country.

2.3.8 Sub-contractor and supplier risks

Sub-contractor and supplier risks can be called as country risk. Non-availability of materials, poor quality materials, material delays, fluctuation of cost of materials and equipment are items of those risks. Moreover; poor quality of work, poor performance, lack of skilled labors are some crucial risks which considered as sub-contractors’ risks.

3 CONSTRUCTION CONTRACTS

Contract word is defined in (The Oxford English Dictionary) as "*a written or spoken agreement, especially one concerning employment, sales or tenancy that is intended to be enforceable by law*". Its synonyms are agreement, commitment, arrangement, and undertaking. Contracts are part of life's rich tapestry. People are using it in our daily life unknowingly. For instance, promising to someone, buying tickets, lending money to someone, dating, borrowing a pen from a friend or taking bus to go to school, are all common daily contracts, which everybody do it even unwittingly. Contract is used everyday life unknowingly while promising to someone, buying tickets or borrowing an eraser from a friend.

A construction contract is a binding between owner (employer) and contractor to a specific project. The employer initiates the project, defines their requests from it, controls the construction, gives the payment to the contractor and after the completion of the project, occupies it. (Totterdill, 2006).

Construction contract is a reciprocal contract, which charge responsibilities on both sides. Contractor is become indebted to construct and handover the work and owner is become indebted to pay the required price (Özer, İnşaat Sözleşmelerinden Doğabilecek Uyuşmazlıkların Alternatif Hukuki Çözüm Yolları, 2012).

3.1 FIDIC

Roots of FIDIC reach 22 July 1913, the World Exhibition in Ghent in Belgium. Since the founders are mostly Francophone, the word FIDIC is acronym of "*Fédération Internationale Des Ingénieurs-Conseils*" which means "*the International Federation of Consulting Engineers*". The founding partners were Belgium, France and Switzerland. However, it started to be known as an international organization rather than European club, in the late 1950s, after the participation of Canada, Austria, South Africa and the United States. Now, there are more than 80 member countries which make this organization much more inclusive

and international (Baker, Mellors, Chalmers, & Lavers, 2013). Turkish consultant engineers and architects union is representing Turkey in this organization.

In FIDIC Statues and By-Laws Book, the objective of the federation is as follows:

1- *Represent the consulting engineering industry globally,*
2- *Enhance the image of consulting engineers,*
3- *Be the authority on issues relating to business practice,*
4- *Promote the development of a global and viable consulting engineering industry,*
5- *Promote quality,*
6- *Actively promote conformance to a code of ethics and to business integrity,*
7- *Promote commitment to sustainable development*

(FIDIC Statues and By Laws, 2011)

With the technological development, international projects and investments were expansioned throughout the world. In addition, multi-lateral development banks encouraged big infrastructural investments to the developing countries and that increased the competition between international construction firms. As a consequence of this development, international standard contract type had become a necessity. Especially, in order to overcome the negative effects of differences in law, economic development, culture and perception. In order respond this need; FIDIC published its first book "*Conditions of Contract International for Works of Civil Engineering Construction; Redbook*" on 1957 by aiming on the standardization of the contracts with the knowledge and the experience of specialized organizations. (Alpkökin, Gürcanlı, Akansu, & Ertürk, 2010).

The first book was successful in civil engineering and infrastructural projects. The detailed design was being designed by the employer and the engineer and supplied to the contractor. However, it was not best suited for the plant projects which items were manufactured away from the site. Therefore, "Yellow Book" was published in 1963 to cover mechanical and electrical works. Yellow Book drew attention to the testing and commissioning and also it was more suitable for the plant projects (Glover, 2007).

In 1987, new editions of both Red (Now it is called "The Old Red Book) and Yellow Books published. The main innovation for Red Book was giving the engineer a

responsibility. With this responsibility, the engineer must act impartial when taking an action or giving decision if they affect the rights and obligations of the parties (Glover, 2007).

Orange Book was published in 1995 for design and build and turnkey projects. In this book, the engineer dispensed and instead of it "Employer's Representative" is provided. Hence, an independent Dispute Adjudication Board (DAB) was introduced for giving decisions fairly. After that, new edition of Red Book and Yellow Book also started to use DAB (Glover, 2007).

3.2 FIDIC Rainbow

After publishing the first book in 1957, FIDIC continued to publish to adjust the developing construction sector and its growing trends. In 1999, FIDIC published three books as Suite of Contracts, "the new Red, Yellow and Silver Books" (Battrick & Duggan, 2014)**.** This section of the thesis will cover the FIDIC Rainbow contracts.

3.2.1 Red book

Red Book, the Conditions of Contract for Construction for Building and Engineering, is the doyen of the FIDIC Contracts. Its 1st publication was in 1957, then 2nd 1969, 3rd 1977. These first 3 versions resembled Institution of Civil Engineers (ICE). 4th edition published in 1987, eluded from the ICE heritage and became first exclusive FIDIC-led contract. This edition still available despite of its newer edition published in 1999 (Baker, Mellors, Chalmers, & Lavers, 2013).

In 1999, FIDIC published the 1st edition of new rainbow suite Red Book.

Red Book also known as "Conditions of Contract for Construction" and it is designed for building and engineering works designed by the employer. Progress payment is paid according to the work done and the rates as per a bill of quantities. Risk shearing is balanced between the employer and the contractor. "Adverse physical conditions" and "operation of forces of nature" is considered as unforeseen events and employer takes the risks (Battrick & Duggan, 2014).

3.2.2 Yellow book

Yellow Book is the second oldest book of FIDIC. Its first version published 1963. The Rainbow Suite new version of Yellow Book is also known as "Conditions of

Contract for Plant and Design-Build". It covers both the old editions of the Yellow book and the Orange book. Design is prepared by the contractor in compliance with the employer. The engineer controls and approves the work done and determines the time extensions. Yellow Book contracts are usually lump sum price and the money paid according to the achieved milestones and the engineer's approval. That shows Yellow Book contract should be used in foreseen project in every aspect. The risk sharing of the book is as same as the Red Book (Battrick & Duggan, 2014).

3.2.3 Green book

Green Book, Short Form of Contract, was published in 1999. For simpler projects, the main forms of FIDIC Contracts were rather too long and complicated. For this reason, FIDIC prepared a simpler type of contract for the projects which value is about US$ 500,000 and 6 months duration (Wade, 2005).

The book consists of 15 clauses and it is only 10 pages. Its sentences are short and language is not complicated. The book is applicable a lot of type of simple project such as roads, water and sewage projects, even they exceed US$500,000. The World Bank found it useful and incorporated in their Standard Documents for Simple Works (Wade, 2005).

The risk is balanced as in Red and Yellow Books. Design can be prepared by either employer or the contractor. Payment can be paid by lump sum or another type (Wade, 2005).

3.2.4 Silver book

Silver Book is also included in the 1st edition of the Rainbow Suite of FIDIC contract type books. It published in 1999 and it has been used in Engineering Procurement Construction (EPC) and Turnkey projects. Silver Book's difference between the others is that the risk is not balanced between the contract parties. In this book contractor covers more risks relative to cost and time, for example ground conditions and completion date of works. Nevertheless, owner carries some risks like; war, terrorism, force majeure (Battrick & Duggan, 2014).

Design is prepared by the contractor as per owner requirements. The project will be handed over as "Turn-key" to the employer. The contract is a lump sum contract and the payment system is similar with the Yellow Book (Battrick & Duggan, 2014).

Consequently, with the Silver Book, contractor takes the most of the risk and employer pays more to cover those risks. The project completion date and the final price are more certain than the other books (Wade, 2005).

3.2.5 White book

White Book is about agreement between client and consultant. Its 4th edition published in 2006. It is used in pre-investment and feasibility studies, the design phase and the administration of a contract. The contract also limits the risks of the consultant such as; agreement risks or legal requirement of the country risk (Battrick & Duggan, 2014).

3.2.6 Blue (turquoise) book

Blue book considers dredging and reclamation projects. Its 4th edition issued in 2006. The book is similar to green book in flexibility and simplicity aspects. General conditions are only 15 clauses and 16 pages (Battrick & Duggan, 2014).

The design is usually prepared by the employer. Different types of payment can be used such as lump sum, cost plus and remeasurement. Also, the payment terms are very flexible. Contractor has a right to make a claim if any forces of nature affecting the site which an experienced employer could not be expected to take precautions (Battrick & Duggan, 2014).

3.2.7 Pink book

It is a special type of Red Book usually called as MDB (Multilateral Development Banks) Harmonised Edition. First publication of the book was in 2004 and then in 2006, it was revised. The book is different from the other books because, it is a product of collaboration with and external organizations. Discrepancy from Red Book is as follows; social utility clauses, amendments to the dispute resolution regime, provision of loan facility related provisions and introduction of MDB-related requirements such as additional provisions relating to corrupt or fraudulent practices (Baker, Mellors, Chalmers, & Lavers, 2013).

3.2.8 Gold book

DBO types of contracts are becoming more famous in governmental departments for the projects. Accordingly FIDIC responded those needs and published a book,

whichcan answer both employers and contractors who are also operators too. Gold Book is the newest book among the others and its subject of specialty is Design Build Operate (DBO) contracts (Battrick & Duggan, 2014).

In DBO investments, operation duration by the contractor is defined as 20 years. Risk allocation is similar to Yellow Book while Design Build. Payment is lump sum. If there is any surplus on the cost, it will be fund at the end of the 20 years is divided equally. Employer deduct 5% of payment from operation service period (OSP), in the event of contractor does not fulfill the maintenance obligations. DAB is established for design build phase and every 5 years during OSP (Battrick & Duggan, 2014).

3.3 Turkish Procurement Law

The first law of governing the public acquisition went in effect on 02.05.1925 in Turkish Republic. The law no 661 composed of 26 articles which can be considered as a short form of law text. Sealed bid tender system was used for tenders. Successful tenderer will be chosen as "worthy" from the tenders. However, "worthy" word did not describe in the law. This law remained in force until 1934. (Danışman, 2013)

Institutionalization started in 1930s and "the law no 2490" which arrange relationship of contractor and government, came into force on 02.06.1934. It was prepared for the first decades of the Republic. Due to this law had remained in force for 50 years; the law could not be able to answer the requirements of the developing economy on the following decades. That is why, The Law no. 2886 "Government Procurement Law" accepted as the new procurement law on 01.01.1984. It was consisted of 96 articles and it had important differences than the previous one. To illustrate; lucidity and competitiveness principle assured, different types of procurement techniques accepted (Danışman, 2013).

Finally in order to adapt the European Union norms and the developing conditions, the law no 4734 is accepted as the new Public Procurement Law on 04.01.2002. It is coherent with the United Nations Standards (UNCITRAL) (Danışman, 2013).

3.4 The Law No 4734 Public Procurement Law

4734 PPL accepted on March 2002 and inured in 01.01.2003. The aim of the new law is the controlling the budget. In addition, providing transparency, competitiveness and reliability are the core principles of the law (Çalapkulu, 2010).

3.4.1 Section 1 – application principles

3.4.1.1 Purpose of the law:

The first article of 4734 defines the law as "*the purpose of this Law is to establish the principles and procedures to be applied in any procurement held by public authorities and institutions governed by public law or under public control or using public funds*".

3.4.1.2 Basic principles of the law:

Article 5 defines the fundamental principles as;

- "*the contracting authorities are liable for ensuring transparency, competition, equal treatment, reliability, confidentiality, public supervision, and fulfilment of needs appropriately, promptly, and efficient use of resources*"

- Goods services and works cannot be purchased together in the same procurement if there is not any acceptable natural connection.

- Procurement of goods, services or works cannot be divided into lots for not to exceeding the threshold values.

- The principle procurement methods are open and restricted procedures for the procurements to be held in accordance with this law. The other methods may be used under the special conditions set out in the law.

- If there are not enough budgets, the procurement proceedings shall not be initiated.

3.4.1.3 Tender commission:

Tender commission composed of minimum 5 members and odd numbers. Commission needs a chairperson, two contracting specialist and accounting and finance responsible. If there is not enough qualified person in one authority, they can be invited from other authorities.

Each member of the commission shall be provided with a copy of records of procurement proceeding dossier within three days in order to make the required inspection.

3.4.2 Section 2 – rules on participation

3.4.2.1 Threshold values

Threshold values are used for the article no 13 and 63. Those monetary limitations updated every year on February month in accordance with the article 67.

3.4.2.2 Estimated cost

Estimated cost is calculated by the authority before the procurement of the goods, services or works. This cost is kept hidden and is not stated in tender or pre-qualification advertisements, and is not be explained to tenderers or to the others who do not have any formal relationship with the tender proceeding.

3.4.2.3 Rules on qualification

Article 10 defines the participation requirements for the procurement proceedings. Economic, financial, professional and technical qualification documents, statements and information are required to submit.

3.4.2.4 Ineligibility

The people who involved in the crimes under the scope of Prevention of Terrorism Law or organized crimes or bribing crimes or fraudulent bankruptcy are ineligible for procurement works. Contracting officers who carrying out the process and officers who are assigned to prepare, execute, complete and approve all procurement proceedings of the project cannot participate in the procurement. Moreover, the spouses, relatives up to third degree and marital relatives up to second degree, and foster children and adopters of that authority are ineligible. Also, they shall not even participate as consultancy services or subcontractors.

3.4.2.5 Specifications

Contracting authority must prepare the administrative and technical specifications of the goods, services and works. Technical criteria of those shall be specified with the

tender documents. Technical specifications should include arrangements to ensure conformity with national and/or international technical standards.

Tender notice periods and rules and Prior Notice:

Article 13 defines the tender periods and gives sufficient time to prepare it for different kinds of tenders.

3.4.2.6 Joint ventures

Joint ventures can be either in the form of business partnership or as a consortium. Business partnership acts as one for the project. However, in consortium, every member is responsible from different part of the project. At the tender stage, contractor authorities decides, if consortium allowed or not.

3.4.2.7 Sub-contractors

Tenderers may be asked to specify the portion of the contract, which they plan to assign to a sub-contractor during tender stage. Tenderers are required to submit their sub-contractor list for approval to the contracting authority. However, assigning a sub-contractor to a specified portion of the project does not release the contractor from its own liabilities.

3.4.2.8 Cancellation of tender prior to the pre-determined time for submission of tenders

Contracting authority may be canceling the procurement procedures at any time where necessary. In the circumstances, tenderers shall be notified promptly and their submitted tenders shall be returned to them unopened. Tenderers may not make any claims because of the cancellation of the process.

3.4.3 Section 3 – procurement process

3.4.3.1 Applicable procurement procedures

3.4.3.1.1 Open procedure

Open procedure is a procedure where all tenderers may submit their tenders.

3.4.3.1.2 Restricted procedure

Tenderers who are invited according to their pre-qualification by the contracting authority can submit their tenders. This kind of procedure is followed when the procurement of goods, services or works require specialty and/or high technology. Also, it is used when the procurement exceeds the half of the threshold value.

3.4.3.1.3 Negotiated procedure

This procedure is used if there is no tender submitted during open or restricted procedures, or if there is unexpected and unforeseen events such as natural disasters or risk of losing lives, or if there are specific events relating to defense and security, or if there the procurement of the goods, works or services are impossible to be defined the technical and financial aspects.

3.4.3.1.4 Public procurement authority

The Public Procurement Authority described in article 53 as "*In order to carry out the duties assigned with this Law, Public Procurement Authority with public legal entity, which is administratively and financially autonomous, has been established. Public Procurement Authority is assigned and authorized for the accurate implementation of the principles, procedures and proceedings specified in this Law*".

The authority related with the Ministry of Finance. However, it is independent in fulfillment of its duties. Nobody can issue neither orders nor instuctions for the purpose of influencing the decisions of the authority.

From the beginning to the end of the tender process, authority checks if there is any violation related legislative provisions, preparing and guiding the implementation of all the legislation of the standard tender documents and contracts, providing training about the procurement legislation, keeping records of the prohibited participants are duties of the Public Procurement Authority which described in article 53.

3.5 The Law No 4735 Public Procurement Contracts Law

The first article defines the law as "The purpose of this Law is to establish the principles and procedures that pertain to making and implementing public procurement contracts under Public Procurement Law". Scope of the law is to apply the contracts, which are resulted of the tender processes carried out by public entities

and institutions by the law 4734 (Law on Public Procurement Contracts Law No:4735, 2002).

Principle of the mentioned in the article 4;

> *In contracts to be made pursuant to this Law, no provisions may be included in a contract contrary to the tender documents.*
>
> *Contract provisions shall not be amended, nor shall supplementary contracts be made, other than the cases specified in this Law.*
>
> *The parties to public procurement contracts made under this Law shall have equal rights and obligations in implementing the contractual provisions. Any articles contrary to this principle shall not be included in provisions of either the tender documents or contracts. This principle shall be kept in view in any interpretation of this Law as well as in its implementation.*

3.5.1 Contract categories

According to the tender process, contract type can be varied as below:

Turnkey lump sum contracts are used for the procurement of works. The contracts shall be made over the total tender price of the work proposed by the tenderer according to the project.

Lump sum contracts are used for the procurement goods or services. The contract shall be made over the total tender price for the entire work which specifications and quantities are determined by the contract.

Unit price contracts shall be calculated by multiplying the quantity for each work of the item specified in the schedule prepared by the contracting entity.

Combined contracts are used for the procurement of works. The contract is the combination of turnkey lump sum and unit price.

3.5.2 Contract implementation

3.5.2.1 Eligibility for price difference

The Public Procurement Authority has the authority to establish the principles and procedures governing payment of price differences for different contract categories. However, price difference shall not be amended after signing of the contract.

3.5.2.2 Insurance coverage of works and works site

Contractor is responsible from the insurance of all kinds of the machinery, equipment, materials, facilities and the finished portion of the work against natural disasters and other risks. The insurance starts from the date of commencement and ends at the date of final acceptance.

3.5.2.3 Force majeure

At the article 10, force majeure are stated as; natural disasters, legal strikes, epidemic cases, announcement of partial or general mobilization. Also, the similar circumstances may be defined by the authority.

Force majeure's outcomes are usually time extension and contract termination. However, it is necessary that these problems shall not arise from the contractor's fault in order to get the outcomes.

3.5.2.4 Supplementary performance security

In the contract awards involving price difference, the new contract awards supplementary performance security shall be obtained in the amount of 6% of the price difference. It can also be deducted from the payments.

3.5.2.5 Returning of performance security and supplementary performance security

When the contractor fulfills the contractual obligations according to the provisions of the contract and tender documents and if the contractor is not in debt to the contracting entity in any cases, performance security and supplementary performance security is paid accordingly.

In works; half of the amount is returned after completion of the work. If any deficiencies or errors it is deducted. The other half is paid when finishing document is taken from the Social Security Institution which certifies having no further connection with and after the minutes of final acceptance.

In contracts other than works; when the Social Security Institution submitted the having no further connection document, half of the amount returns. The other half returns after the guarantee period.

However; if there is any debts to the contracting entity or Social Security Institution or wage or taxes have not been fully paid, the amount shall be deducted and remaining is returned.

3.5.2.6 Contract amendments

There may be an amendment about location of the work or place of delivery or duration of work or conditions of payments, after contract signing if the contract price is not exceeded and contractor agree.

3.5.2.7 Assignment of contract

Contract may be assigned to a third party if there is a necessity and with the permission from the contractor officer. However, the third party must possess the qualifications as originally specified in the tender process. Any contractor, who applied assignment of contract process, may not assign or take over another contract for three years.

3.5.2.8 Contractor's death, bankruptcy, falling seriously ill, or being arrested or convicted

Article 17 describes the procedures of the contractor's death, bankruptcy, falling seriously ill, or being arrested or convicted.

If the contractor deceased, contract may be terminated. Receivable shall be handed over to the inheritors. If there is a willing inheritor who suits qualifications may continue to the work.

In the case of bankruptcy, contract shall be terminated.

If the contractor is unable to continue to fulfill the commitments because of illness, being arrested, or receiving a freedom restricting court sentence, contractor may select a proxy within 30 days. If there will not be any appointment as proxy, contract terminated.

3.5.2.9 Termination of contract

Contractor may end the contract by noticing being unable to perform its obligations. In this case; performance security and supplementary security shall be revenue to the accounts.

Article 20 mentions what if the contract is terminated be contracting entity. In that case, contractor fails to do the work as specified in the tender documents or fails to complete in specified duration. The contractor gets warning and offering at least 20 days advance notice to apply to the penalty for delay. If the contractor has engaged in the article 25 which is about deeds and behaviors outlawed, contract shall be terminated and the performance security and supplementary security recorded as revenue. However, if the 80% of the work is finished and there is no such time to a new tender, contractor may finish the work but the action shall be taken against the contractor in accordance with article 26.

If the contract is terminated due to the force majeure, the accounts shall be wound up and performance security and supplementary security shall be returned.

3.5.2.10 Additional works to be made under the contract, work decreasing and winding-up contract

Article 24 describes additional works, work deceasing and winding-up contract.

Work increase may be considered as an unforeseen event. If the contract is lump sum turnkey, 10% of the work increase is allowed. When the contract is unit price, work increase may be 20% of the budget and also with the grant of Council of Ministers; it may reach up to 40%.

In case the work cannot continue under these circumstances, the accounts shall be wound up in accordance with general provisions, without any increase.

If it is realized that the work can be finished the lower contract price than 80% of the contract price, contractor responsible to finish the work. In this case, 5% of the difference between 80% of the contract amount and the amount work performed is paid to the contractor as a reward.

4 CONSTRUCTION DISPUTE RESOLUTION

Oxford Dictionaries defines dispute as "*a disagreement or argument*". During the application process of the contracts, different understandings of content of the contract constitute disputes between contractor and the owner. These disputes usually occur because of legal, technical or contractual condition issues (Danışman, 2013).

In Dispute Board book Chern gives an anecdote about Lord Donaldson who is one of the great judges of England:

> *"It may be that as a judge I have a distorted view of some aspects of life, but I cannot imagine a civil engineering contract particularly one of any size, which does not give rise to some disputes. This is not to the discredit of either party to the contract. It is simply the nature of the beast. What is to their discredit is that they fail to resolve disputes as quickly, economically and sensibly as possible."* (Chern, 2011)

The nature of construction contract disputes is understood that it is inevitable. However, amicable settlement is recommended since it is cost saving, time saving and practical (Tezcan, 2006).

Most of the contracts do not define the meaning of "dispute" word. Still, it can be considered as the similar meaning in usual life (Alpkökin, Gürcanlı, Akansu, & Ertürk, 2010). In 1999 FIDIC Red Book Sub-Clause 20.4 merely states;

> *If a dispute (of any kind whatsoever) arises between the Parties in connection with, or arising out of, the Contract or execution of the Works, including any dispute as to any certificate, determination, instruction, opinion or valuation of the Engineer, either Party may refer the dispute in writing to the Dispute Adjudication Board (DAB) for its decision, with copies to the other Party and the Engineer.*

Consequently, the Sub-Clause defines that there is no restrictions for disputes which can be referred to the DAB.

Richbell investigates dispute in three main groups which can be seen in Figure 4.1. Moreover, Figure 4.2 shows the relationship, time and cost status between parties while using the ADR methods:

- Consensual – parties agree a solution themselves or with a help with an independent party.
- Recommended – a solution is recommended by a third party. The solution does not have a binding effect
- Imposed – a third party gives a binding decision (Richbell, 2008)

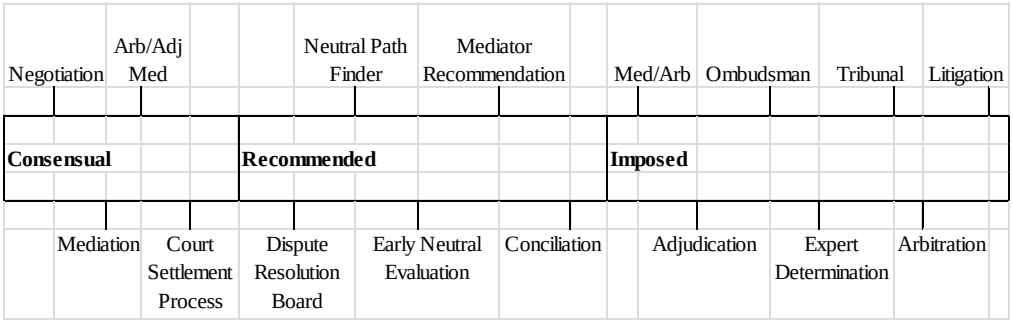

Figure 4.1 : Dispute resolution methods

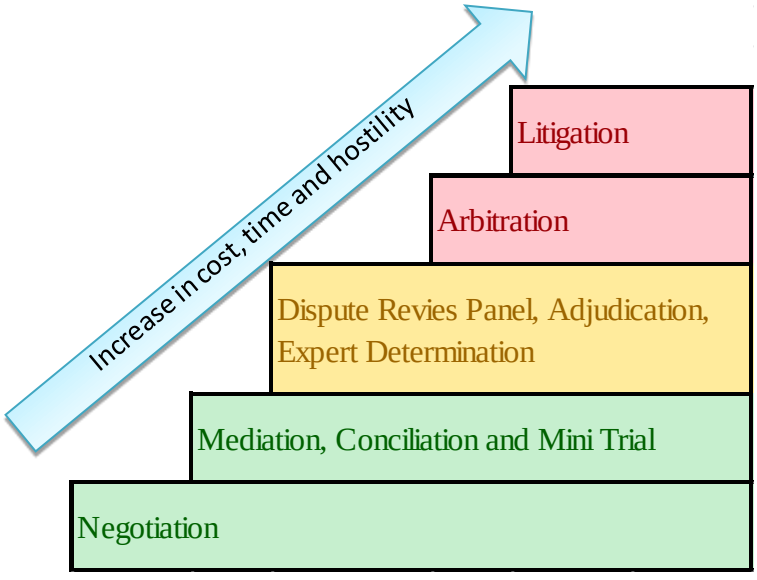

Figure 4.2 : Dispute resolution hierarchy

4.1 Dispute Resolution Methods

4.1.1 Negotiation

Negotiation means talking, thinking and discussing on an issue. Kekeç explained it as an interaction process of parties to try to solve the differences and reach a conclusion by talking, arguing and convincing each other. (Kekeç, 2014)

Negotiation can be considered as the best and easiest way to resolve a dispute. Fever people is involved, thus it takes less time. It is a daily life dispute resolution system. The most crucial aspects of negotiation are communication and willingness to compromise. Lack of those aspects led negotiation process to a dead end. Negotiations can be public or private depending on the wishes of the parties (Richbell, 2008).

Kekeç grouped negotiation as four approaches:

- Competitive Approach: Parties tries to be the winner of to get the best benefit for themselves.
- Cooperative Approach: The main purpose of this approach is fairness. Parties act with good faith and suggest reasonable offers instead of exaggerated one.
- Problem Solving Approach: This approach is based on positive-sum. The purpose of the approach is to satisfy the wishes of both parties.
- Remedial Negotiation: It is used as reconciliation of parties.

4.1.2 Mediation

According to National Alternative Dispute Resolution Advisory Council, mediation means a process that helps to identify the disputed subjects, find solutions and evaluate the alternatives. Mediator does not have any effect on the content of dispute or any influence to solve the dispute. Mediator can only give advice and decide procedure of the mediation process (Kekeç, 2014). United Union has also a similar definition about mediation in International Commercial Mediation law. Therefore, the principles of mediation are as follows:

- First principle; mediation is an alternative of Governmental law (litigation)
- Second principle is an addition of neutral third person.

- Third principle is; mediator does not have any right to give binding decision. She/he cannot judge parties or decide right or wrong. Mediator only tries to settle the issue.
- Forth principle is willingness. The important issue here is parties must be voluntary to settle the dispute.
- Mediator takes his/hers power from the parties
- The sixth principle is confidentiality (Özer, İnşaat Sözleşmelerinden Doğabilecek Uyuşmazlıkların Alternatif Hukuki Çözüm Yolları, 2012).

4.1.2.1 Selection of mediator

According to Richbell, a mediator must have "*patience, optimism, clarity of communication, and ability to build quick relationships and inspire trust*". Moreover, he also adds good listening skills, stamina and a sense of humor with other characteristics. There are three ways to select a mediator:

- Use a provider – There are 50 provider organization within UK
- Go direct to an independent
- Use a scheme

Mediators charge their services in

- Lump sum
- Day fee plus preparation at an hourly rate
- Hourly rate

4.1.2.2 Preparation before mediation sessions

Some preparations are should have to be done before mediation starts to have a successful mediation process. Mediator may arrange some pre-meetings with parties privately. Those meetings led parties to become familiarize and get to know the mediator (Kekeç, 2014).

Mediator may require some documents and writing about the dispute. The purpose here is to give an opinion about the dispute to mediator (Kekeç, 2014).

4.1.2.3 Presenting at the mediation

4.1.2.3.1 Opening session:

In this session mediator makes the first speech. S/he presents himself/herself, and then presents parties. After that, mediator explains his/her role, authority and administrative affairs (Kekeç, 2014).

Moreover, it should be reminded to the parties that they also have right to take legal advice and try judicatory ways. Parties hold these rights until they reach an binding agreement (Kekeç, 2014).

After mediator's speech, parties make their opening statements. They explain the reason of the dispute, legal basis, material facts and evidences (Kekeç, 2014).

In the opening session, an agenda is determined about which subjects are going to be discussed (Kekeç, 2014).

4.1.2.3.2 Private caucuses:

This stage is an exploring stage for mediator. Since private caucuses are confidential; S/he consolidate rapport to speak openly and frankly with parties, finds out a more complete picture of the dispute and understand the need of the parties rather than their demands and wishes (Richbell, 2008).

4.1.2.3.3 Negotiating at the mediation

Figure 4.3 is suggested by Pepperdine University to show typical negotiation zone. Negotiations are quicker and more acceptable when the parties' offers are close the zone. Therefore, purpose of the mediator is to get parties to somewhere near to this position (Richbell, 2008).

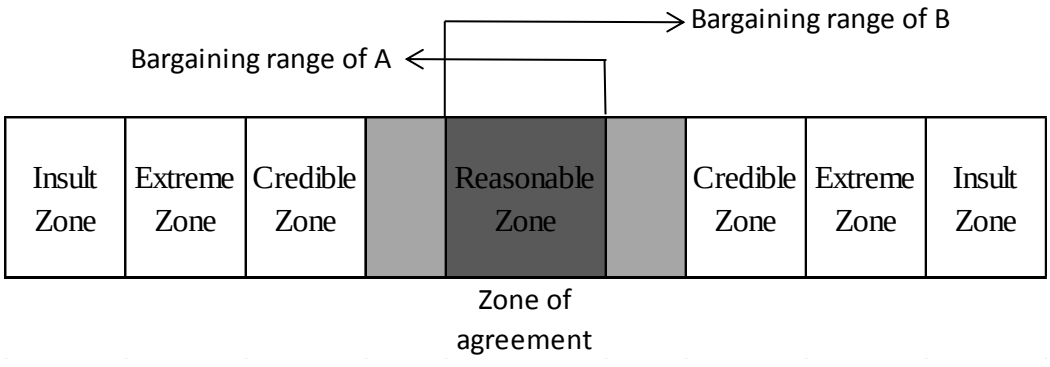

Figure 4.3 : Negotiation zone of mediation

After offers are submitted, parties retreat to their room to discuss. It the joint meeting was well, there will be some information to analyze.

Mediation procedure usually continues in exploring negotiating and concluding which can be seen in the Figure 4.4. There may some returns. The reasons of those returns are a new issue or old one need to further understanding (Richbell, 2008).

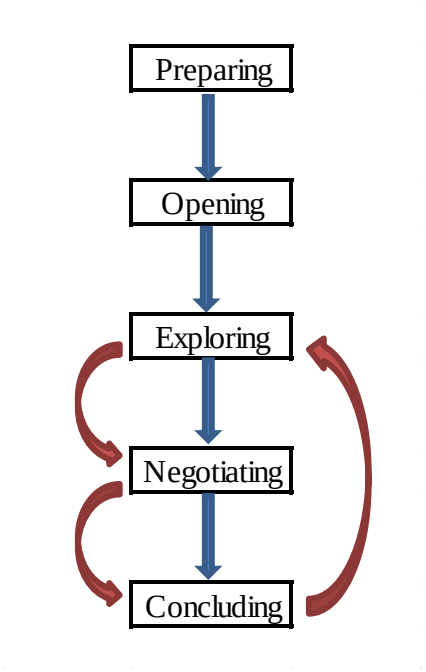

Figure 4.4 : Sections of mediation process

Mediation process can get into deadlock during the process. At this point, there are some ways to follow which are;

- Finding the root of the problem by checking previous analysis. The results for the parties should be investigated whether more attractive solution are reached during the mediation process or not.
- Making changes of negotiation environment or method is another tactic to breaking the deadlock. Taking a break, getting fresh air, making jokes are key elements to smoothen the air of the process.
- Struggle with parties may be necessary if they are fixed in their initial position. The consequences of that situation is presented, for example if there will not be any settlement in mediation process, cost of litigation and time to loose will be reminded to the parties.
- Supporting the parties is another alternative. In this way, mediator encourages parties to change their positions.

- Changing the agreement may be a solution to the deadlock. Sometimes the agreement may be the problem because of its vagueness and incompetent (Kekeç, 2014).

4.1.2.3.4 Concluding the mediation

Possible ways to conclude of the mediation are;

- Parties reach an agreement
- Part deal: Parties agrees on some items however, unable to reach a settlement on all issues.
- No deal

4.1.3 Arb/med and adj/med

In this process arbitrator or adjudicator makes a binding decision but does not reveal it. First, he/she invites parties and negotiates with them. Try to settle the issue. If they reach a settlement, they write and sign it. If they fail to reach a settlement, Arb/Med and Adj/Med decision is delivered and it is binding (Richbell, 2008).

4.1.4 Court settlement procedure

Court settlement procedure (CSP) is introduced by Technology and Construction Court in 2006. The procedure is similar with mediation where the mediator is a judge. If parties do not reach a settlement, judge offers an opinion. The opinion is not binding and if it does not accepted, the case has to be withdrawn (Richbell, 2008).

4.1.5 Neutral fact finding

A neutral expert investigates particular issues and reports jointly to the parties. NFF's purpose is to clarify the issues that cause blockage between parties. Their result is non-binding (Richbell, 2008).

4.1.6 Conciliation

Conciliation is similar with mediation and the meanings are confused sometimes (Kekeç, 2014). In conciliation process similar to mediation, parties try to reach an agreement with a help of a conciliator. If an agreement does not meet, conciliators suggestion is be accepted during arbitration period in UK according to Construction Conciliation Group (CCG). According to Institution of Civil Engineers (ICE),

conciliation provides a binding solution only if parties agree the solution (Richbell, 2008).

4.1.7 Arbitration

Arbitration is a traditional form of dispute resolution method. Yates (2011) defines arbitration as "*a process whereby neutral third party or several people are hired to evaluate evidence, listen to the argument of both parties, and provide a binding or non-binding decision and settle award*" (Richbell, 2008).

Arbitrators possess high technical knowledge unlike a judge, Parties can have right to select the law to be applied for the process. Arbitration offers a private process which help parties to preserve their reputations (Al-Humaidi, 2014).

Rather than ADR, decision of arbitration is legally binding and the outcome is win-lose situation.

4.1.8 Litigation

Litigation is a traditional dispute resolution method. A judge who has limited knowledge on specific dispute, listens the argument. Relevant law is applied about the dispute and judge announces the binding decision. . A trial takes several days, usually weeks. It not unusual that, some cases last years (Richbell, 2008).

Litigation decision is a win-lose decision, which means there are an absolute winner and a looser.

4.1.9 Dispute boards

Owen and Totterdill define a dispute board (DB) is *"a tribunal which is established to endeavor to avoid or resolve any disputes which may arise between the parties to a particular contract".* (Owen & Totterdill, 2007).

Dispute board is a general term, which includes dispute review boards (DRB), dispute adjudication board (DAB) and combined dispute board (CDB). DRB is used mostly in United States and can only provide non-binding recommendations. On the other hand DAB's decisions are legally binding and it is the most common DB except United States. CDB is created by International Chamber of Commerce (ICC) and it is combination of both DRB and DAB.

The member of a dispute board must have detailed knowledge and experience about the contract and the procedures. Also, they need to have certain characteristics such as; independence, impartiality, proactivity, judicially (Owen & Totterdill, 2007).

4.1.9.1 History of dispute boards

Dispute review board concept originated in United States. The first report was in 1960s. It was on boundary dam in Washington. The name of the board was "Joint Consulting Board" and their duty was taking decisions regarding conflicts and other related matters. The board worked well. Thus, the idea of dispute boards began to grow (Chern, 2011).

Both FIDIC and Institution of Civil Engineers (ICE) introduced "the engineer" to act as a judicial manner in settling disputes between contracting parties. However, since the engineer is paid personnel of the owner, its independence was questioned and parties' usage of arbitration courts increased (Chern, 2011).

In 1980, dispute review board is used in a large-scale dam and hydroelectric facility in Honduras, which was funded by World Bank. The contractor was Italian, controller was Swiss and the owner was Honduras Electrical Company, which had no experience with international contractors in such huge project. Dispute review board successfully foreseen the potential problems and resolved them. As a consequence, the usage of dispute review boards started in international projects (Chern, 2011).

World Bank published Procurement of Works that was a modified FIDIC contract with dispute review board. However, the board's decisions were non-binding. In 1995, FIDIC introduced dispute adjudication board with its Orange Book. After that in 1999, DAB placed in the contracts instead of the engineer as a dispute adjudicator. Also, DAB's decisions were binding (Battrick & Duggan, 2014).

Recently, FIDIC, World Bank and other development banks worked on a harmonized set and FIDIC published Harmonized Book. Dispute adjudication board is utilized.

4.1.9.2 Essential characteristics of a dispute board

Members of dispute boards must satisfy the requirements of knowledge, experience of contract and DB procedures. They also must be, independent, impartial, proactive and judicial according to Owen and Totterdill.

The member shall not have any connection with neither party. If there is any connection between one of the party past or present, it shall be declared. If the other party objects, the membership must be declined. Members are chosen from parties but that shall not mean they are their representative (Owen & Totterdill, 2007).

The member must show her/his impartiality by assessing the dispute only the facts and the law. The member must not have any private conversation or correspondence alone with one party.

Proactivity is a necessity for a dispute board member. DB members should try to eliminate claims before they become disputes. DB members must act proactive within their constraints dictated by the procedure (Owen & Totterdill, 2007).

DB decides and recommends according to the rights and obligations of the parties of a contract. For that reason, DB must be judicial, even though the decision is not the final decision. They must follow the law (Owen & Totterdill, 2007).

Open mindness and respect to others opinion are necessary. Unlike the arbitrator, DB members are together from the beginning to the end of the project, so a harmonious relationship and mutual trusts are important between them (Chern, 2011).

4.1.9.3 The role of dispute boards

The main role of DB is to help to avoid disputes or settle disputes within their limitations.

DB is appointed according to contract or agreement between contractor and employer. Therefore, DB cannot interfere the problem with any other agencies or the engineer unless the engineer acts as an agent of the employer. In addition, DB cannot solve the dispute between contractor and subcontractor. However, if this dispute leads to contractor and employer dispute, DB can give a decision.

4.1.9.4 Types of dispute boards

4.1.9.4.1 Dispute review board (DRB)

Dispute review board is used mostly in United States. If the parties do not agree with the engineer's decision about a dispute, they may request a DRB. The board collects the necessary documents from the both sides and prepares meetings if necessary. Then DRB sends the recommendation to the both

sides. The recommendation is non-binding and if neither side objects within a stated time period, that means both side agreed on the issue. If parties do not agree the recommendation, they may go to arbitration or to courts (Alpkökin, Gürcanlı, Akansu, & Ertürk, 2010).

4.1.9.4.2 Dispute adjudication board (DAB)

Dispute adjudication board started to use instead of "the engineer" in 1995 with FIDIC Orange Book. Dispute adjudication board is rather different than DRB. "Adjudication" word makes the difference. It brings "binding decisions" meaning instead of recommendations. DAB decisions are binding and parties are liable to follow the decision even if they did not like. However, in the meantime, they can submit the dispute to the arbitration or to courts (Chern, 2011).

DAB can give "non-binding" recommendation if only it is mentioned in the contract and the both sides agree (Alpkökin, Gürcanlı, Akansu, & Ertürk, 2010).

4.1.9.4.3 Combined dispute board (CDB)

International Chamber of Commerce developed combined dispute board in 2004. The board is composition of the DRB and DAB. CDB usually gives recommendation unless one of the parties asks decision. In that case of objection, CDB decides whether to issue recommendation or decision. If dispute continues, parties can submit arbitration or courts (Chern, 2011).

4.1.9.5 Aspects of dispute boards

Construction projects frequently have claims, which can lead disputes. To settle the issue there is variety of procedures to follow. For instance; the engineer is for immediate decisions, a facilitator to assist the parties to overcome the issue, a mediator to encourage the parties to find a solution, a conciliator recommends the best solution for dispute, an adjudicator can give interim binding decisions, an arbitrator who gives enforceable decisions or the courts which acts to enforce the law. Those procedures have advantages and disadvantages. DB concept has developed recent years by trying to keeping the advantages of the other procedures mentioned above (Owen & Totterdill, 2007).

Dispute boards consist of experienced, independent and objective members. These features play great importance for international middle and large scale projects. DB can reach a conclusion much faster and cheaper than arbitration or courts.

- The board members are chosen during the contractual stages. Therefore, they are aware current situation of the project. During their site visits, they can arrange meetings about the possible problems. With the meeting, they can state their opinion and prevent a future dispute (Alpkökin, Gürcanlı, Akansu, & Ertürk, 2010).
- DB can analyze disputes and claims and show the progress of each party to settle the issue. DB draws the attention to the important points to settle problems (Alpkökin, Gürcanlı, Akansu, & Ertürk, 2010).
- Responsibility of DB is not design, supervision, quality, methods of construction, so they can give independent and impartial decisions or recommendations for any claim and disputes (Owen & Totterdill, 2007).
- Power of DB is limited when compare with an arbitral tribunal or a judge. Nevertheless, according to Owen and Totterdill "*limited powers which are exercised at the time the problem arose can be more effective than greater powers at a later date*" (Owen & Totterdill, 2007).
- Since they provide a response faster, money flow will not be affected in the case of monetary disputes (Alpkökin, Gürcanlı, Akansu, & Ertürk, 2010).

4.1.9.6 Composition of dispute board

FIDIC contract sub-clause 20.2 tells little but important aspect of dispute board members. In the sub-clause it is defined as:

"The DAB shall comprise as stated in the Appendix to Tender, either one or three ***suitably qualified persons*** *("the members"). If the number is not so stated and the Parties do not agree otherwise, the DAB shall comprise otherwise"*

4.1.9.6.1 Number of members

Normally, the number of members is decided by the employer during the pre-tendering and preparation phase of the project. Also FIDIC Sub-Clause 20.2 mentions about the number of members:

"If the DAB comprise three persons, each party shall nominate one member for the approval of the other party. The parties shall consult both these members and shall agree upon the third member. Who shall be appointed act as chairman".

FIDIC suggests three persons as a default suggestion. However, it can vary depending on the project value and complexity. If the project considered as low value project for example; US$2 million per month, one person can be assigned as DB or if the project consists on different disciplines the number of members even can exceed three persons (Owen & Totterdill, 2007). World Bank asks three members if the project value extents US$50 million, else single or three members can be used (Chern, 2011).

4.1.9.6.1.1 Single-member dispute board:

DB mechanism can be maintained with single member if the three member board cannot be sustained due to the value of project. The disputes can be solved however; resolutions will be single viewpoint (Bunni, 2005).

4.1.9.6.1.2 Two-member dispute boards:

Two-member is used if their professionally is different like one technical, other legally qualified. Both parties should choose these members together. Casting vote is allocated when failing to reach a unanimous decision (Bunni, 2005).

4.1.9.6.1.3 Three member dispute boards:

Three-member DB is common in most projects. Selection of members can have variations. In one alternative, each party choose one member, and then those members choose their chairman. In another alternative; parties choose a chairman and the chairman selects other two. In final alternative, each party selects all members together (Chern, 2011).

4.1.9.6.1.4 More than three member dispute board:

This board is a necessity when the project is complicated and composes several disciplines. To illustrate; dam, nuclear facilities or airport projects are complex projects that a multi member distribute board can be used (Chern, 2011).

The members are selected as their area of expertise. The chairman is appointed either by the selection of those members or by contractor and employer. Chairman selects

related members according to the dispute's discipline. All members have the equal rights and obligations (Bunni, 2005).

4.1.9.6.1.5 Micro dispute board:

It can be used for a minor claim or an accounting problem. They settle the issue quick. It is usually resolve within 30 days. Therefore, parties need to supply all the necessary documents to the board which usually contains one member (Chern, 2011).

4.1.9.6.1.6 Ad Hoc dispute boards:

Unlike the other DB, Ad Hoc DB is assigned when a dispute arises. When they submit their decision their work ends. The reason for this Ad Hoc is saving money. Instead of paying retainer throughout the project, fee is paid only for disputes. However, the idea is rather controversial. Since DB established at when dispute arises, they do not have enough information about neither contract, the parties. Thus, their research process usually takes longer time to be able to prepared (Chern, 2011).

4.1.9.7 Nomination

Usually each party chooses one member for the approval of other party. Then, selected members choose the third member as a chairman. The selection of members period is limited in FIDIC as 28 days as default. The parties can change the period. The limit is required to avoid any delays.

In the event of neither party make the appointment of members, an external appointing entity may be requested to make those appointments. The name of the entity should be named officially in contract documents or in appendix to tender. In FİDİC type of contracts, the default nominator entity is the president of FIDIC or a person selected by the president.

4.1.9.8 Selection of members

The parties can choose their nominee of DB member freely in most of the contracts. The person's characteristic required to be independent and impartial. Usually, employers and contractors have database of the DB members which about their background, their ability to avoid disputes and solve disputes. Parties select a specific member because of various reasons which may be called as "comfort factor" according to Owen and Totterdill.

Moreover, another issue is that; since the DAB has more technical perspective than legal perspective; members should be selected according to their technical perspective instead of legal (law) perspective (Alpkökin & İlter, FIDIC Sözleşmelerinde Uyuşmazlık Çözüm Kurulu (DAB) Uygulamaları, 2014).

FIDIC describes the selection as:

"However, if a list of potential members is included in the contract the members shall be selected from those on the list other than anyone who is unable and unwilling to accept appointment to the DAB

The agreement between the Parties and either the sole member ("adjudicator") or each of the three members shall incorporate by reference the General Conditions of Dispute Adjudication Agreement contained in the Appendix to these General Conditions with such amendments as are agreed between them".

4.1.9.9 Qualities of members

Quality of member has great importance since when they are assigned to the project, they will have a power to give decisions, which must be complied, and they cannot be removed easily if only both parties agreed

FIDIC and Dispute Review Board Training has training courses for them and they have a list of the accredited board members.

Owen and Totterdill describe the criteria for inclusion that:

- Membership of the listing organization
- Appropriate academic and professional qualifications
- Minimum of ten years' experience in a senior position
- Knowledge and experience of the relevant contract documentation
- Formal dispute adjudication training and assessment
- Good interpersonal communication skills
- Ability to be impartial and objective

4.1.9.10 Payment of DB member

Payment clause in FIDIC states:

"The terms of the remuneration of either the sole member or each of the three members including the remuneration of any expert whom DAB consults shall be

mutually agreed upon by the parties when agreeing the terms of appointment. Each party shall be responsible for paying one half of the remuneration".

According to Chern, the cost of three-person DB cost is much cheaper than the arbitration or court cost. It is between 0.015 and 0.020 of the total project cost. If project is bigger, percentage of the DB cost becomes smaller.

The General Conditions define the scope of the payment:

1- Retainer fee: It considered as the member's availability to act payment. It also recompenses the office expenses. It usually anticipated two or three days per month in most forms of contract.
2- Daily fee: This fee covers the site visits including travelling time and also hearing periods.
3- Expenses: The administrative expenses will be paid with the overhead cost.
4- Taxes in country of the project: Local taxes of the country are deducted from the fee.

4.1.9.11 Termination of DB

If at any time the parties so agree, they may appoint a suitably qualified person or persons to replace (or to be available to replace) any one or more members of the DAB, unless the parties agree otherwise. The appointment will come into effect if a member declines to act or is unable to act as a result of death, disability, resignation or termination of appointment.

If any of these circumstances occurs and no such replacement is available, a replacement shall be appointed in the same manner as the replaced person was required to have been nominated or agreed upon as described in this Sub-Clause.

The appointment of any member may be terminated by mutual agreement of both parties, but not by the employer or the contractor acting alone. Unless otherwise agreed by both parties, the appointment of the DAB (including each member) shall expire when the discharge referred to in Sub-Clause 14.12 [Discharge] shall have become effective.

4.1.10 Operation mechanism of dispute board

FIDIC has procedures for Dispute Adjudication Board from beginning to the end of the project. These procedures plays vital role for proper process of Dispute Boards.

Owen and Totterdill's Dispute Board Procedure and Practices Book identify four main functions:

1- Visiting the site regularly and acquaintant to the details of the project.
2- Getting up to date of site activities, progress, developments and problems.
3- Preventing arising dispute by encouraging the parties to resolve the issues.
4- In the event of dispute; if necessary holding a hearing, considering the submissions of the parties, completing the deliberations and preparing a decision in a professional and timely manner.

4.1.10.1 General

The communication language shall be English. Even during social gatherings and formal communications, English is the only language to be used.

There shall be no one-sided communications between DB members. All communications with Dispute Adjudication Board shall be copied to the other party.

DAB shall follow the procedures in the Contract and additional procedures and act in an informal and flexible manner. DAB asses its activities by being impartial, unbiased and neutral (Chern, 2011).

4.1.10.2 Reporting

Reports shall be sent to DAB monthly by the parties. Generally, reports are sent every 15 of each month. Those reports contains actual work progress against the forecast, actual certification against forecast, potential disputes and list of all formal notices of claims (Chern, 2011).

4.1.10.3 Site visits

Dispute Adjudication Board visits site periodically. The interval is at most every four month. Periodic site visits are crucial because it allows DAB members to be acquainted to site. They can check the difficulties if any that affect the progress of the project (Owen & Totterdill, 2007).

4.1.10.3.1 First visit:

After DAB members acquainted with the contract and the technical aspect of the project, the first site visit shall be arranged. It would be the chance to meet the personnel on site and having a real time observation (Bunni, 2005).

At the first site meeting; employer, contractor and engineer must be present. Standard DB procedure and Additional Procedural Guideline, monthly documentation for the parties are discussed at the first meeting. Contractor and employer provide all contract documents, specifications, drawing and any related documents. The parties submit a progress report and anticipated or experienced difficulties and problems (Owen & Totterdill, 2007).

For the first visit of the site, typical agenda shown in APPENDIX A can be used as a sample guideline (Bunni, 2005).

4.1.10.3.2 Periodical visits:

DB member's periodical site visits are an important event on site, since the event gather higher-level administrative and senior staff from the project participants. Thereby, they can discuss issues, which occurred or possibly occur, day to day at site (Totterdill, 2006).

Usually, DB members' visit starts with brief progress update and then site inspection follows it, especially where potential dispute may have arisen. Board members may request private sessions with parties to be able to clarify more technical questions and gather information (Bunni, 2005).

At the end of every site visit a site visit report is prepared by DB. It contains a guidebook and description of activities, site visit details, work status, matters of concern, and next meeting schedule (Totterdill, 2006). The report is sent to the parties by the chairman by attaching the agenda of the visit, and necessary briefing notes which prepared by parties connection with the routine site visit (Chern, 2011).

4.1.10.4 Avoidance of disputes

In construction projects, there may be disagreement. The important thing is to resolve the issue fast and fair before it becomes a dispute. FIDIC Gold Book refers this issue in Clause 20.5 written below:

"If at any time the Parties so agree, they may jointly refer a matter to the DAB in writing with a request to provide assistance and/or informally discuss and attempt to resolve any disagreement that may have arisen between the Parties during the performance of the Contract. Such informal assistance may take place during any meeting, Site visit or otherwise. However, unless the Parties agree otherwise, both Parties must be present at such discussions. The Parties are not bound to act upon any advice given during such informal meetings, and the DAB shall not be bound in any future Dispute resolution process and decision by any views given during the informal assistance process, whether provided orally or in writing".

4.1.10.5 Referral of dispute

FIDIC Red Book Clause 20.4 suggest that " *if a dispute arises between Parties in connection with, or arising out of the Contract or the execution of the Works, including any dispute as to any certificate, determination, instruction, opinion or valuation of the Engineer. Either party may refer the dispute in writing to the DAB for its decisions with copies to the other Party and the Engineer*".

When the chairman of the DAB receives the "*Written Notice*", it is considered as DAY 1 and then countdown starts. The DAB needs to give a decision within 84 days. Therefore, as Bunni refers; DAB required accessing all additional information they require, accessing to site and appropriate facilities. Since the days are limited, Board's request must be satisfied without any delays. It is mentioned Red Book Clause 20.4 as;

"*Both Parties shall promptly make available to the DAB all such additional information, further access to the Site, and appropriate facilities, as the DAB may require for the purposes of making a decision on such dispute".*

After 14 days, referral party submits a reply to the referral to the DAB chairman and to the referring party. Then, mostly within 14 days, referring party sends a response letter to both the DAB and the other party (Chern, 2011).

DAB may require additional information after those submittals by both parties. After that, site visit and hearing days will be planned.

4.1.10.6 Hearing

Unlike the hearing which held in courts, it is much more meeting according to Owen and Totterdill. The reason for it is that, court hearings are for a presentation of the issue to judge who has not work on the case before. However, in FIDIC, DAB has knowledge of the dispute from the beginning. The reason for that is for explanations and information about the case to be presented orally. DAB has power to request a hearing according to FIDIC Procedural Rules 6;

"The DAB may conduct a hearing on the dispute, in which event it will decide on the date and place for the hearing and may request that written documentation and arguments from the Employer and the Contractor be presented to it prior to or at the hearing".

Firstly, referring party make their presentation and refute the referral party's response. Then, referral takes place and makes their presentations. Then DAB asks questions to the witnessed and to the parties to clarify the issue. At the end of the hearing process; both parties submit written and oral closings and any final questions may be asked by DAB (Chern, 2011).

The power of DAB in hearing is mentioned in FIDIC Red Book Procedural Rule 7 and 8 which is as follows:

"Except as otherwise agreed in writing by the Employer and the Contractor, the DAB shall have power to adopt an inquisitorial procedure, to refuse admission to hearings or audience at hearings to any persons other than representatives of the Employer, the Contractor and the Employer's Representative, and to proceed in the absence of any party who the DAB is satisfied received Notice of the hearing; but shall have discretion to decide whether and to what extent this power may be exercised".

"The Employer and the Contractor empower the DAB, among other things, to:

(a) establish the procedure to be applied in deciding a Dispute;

(b) decide upon the DAB's own jurisdiction, and as to the scope of any Dispute referred to it;

(c) conduct any hearing as it thinks fit, not being bound by any rules or procedures other than those contained in the Contract and these Rules;

(d) take the initiative in ascertaining the facts and matters required for a decision,

(e) make use of its own specialist knowledge, if any;

(f) decide upon the payment of financing charges in accordance with the Contract;

(g) decide upon any provisional relief such as interim or conservatory measures; and

(h) open up, review and revise any certificate, decision, determination, instruction, opinion or valuation of the Employer's Representative, relevant to the Dispute".

During the hearing DAB members shall not show any intention of any opinions according to FIDIC Procedural Rule 9. After the hearing, DAB's decision is awaited. DAB gives decision within 28 days after the completion of all party submissions in accordance with FIDIC Clause 20.4 in writing to employer and contractor. As mentioned in Rule 9, DAB members discuss the issue privately and find a unanimous decision.

If a member could not be able to attend the hearing, the other members proceed the to make decision only if;

- Contractor and employer agrees
- The absent member is not the chairman and chairman instructs them to not take any decision.

4.1.10.7 Decision of dispute adjudication board

Give a decision is the most important part of DBs. That is the main reason for them to be paid. The process is shown more detailed in flow charts in Dispute Boards: Procedure and Practice Book (Chern, 2011) as Figure 4.5 and Figure 4.6, which is summarized below. Figures shows the decision process of a usual DAB hearing. Firstly, the facts are gathered and issue is identified. Then disputed fact is found out (Figure 4.5). In Figure 4.6 shows the process of a legal consideration of a disputed fact. Firstly, they identify the legal issues and then, they act accordingly.

- Deciding disputed facts
- Deciding disputed law
- Applying the decided law to the decided facts
- Giving the decision

Flow Chart 1: Consideration of the facts

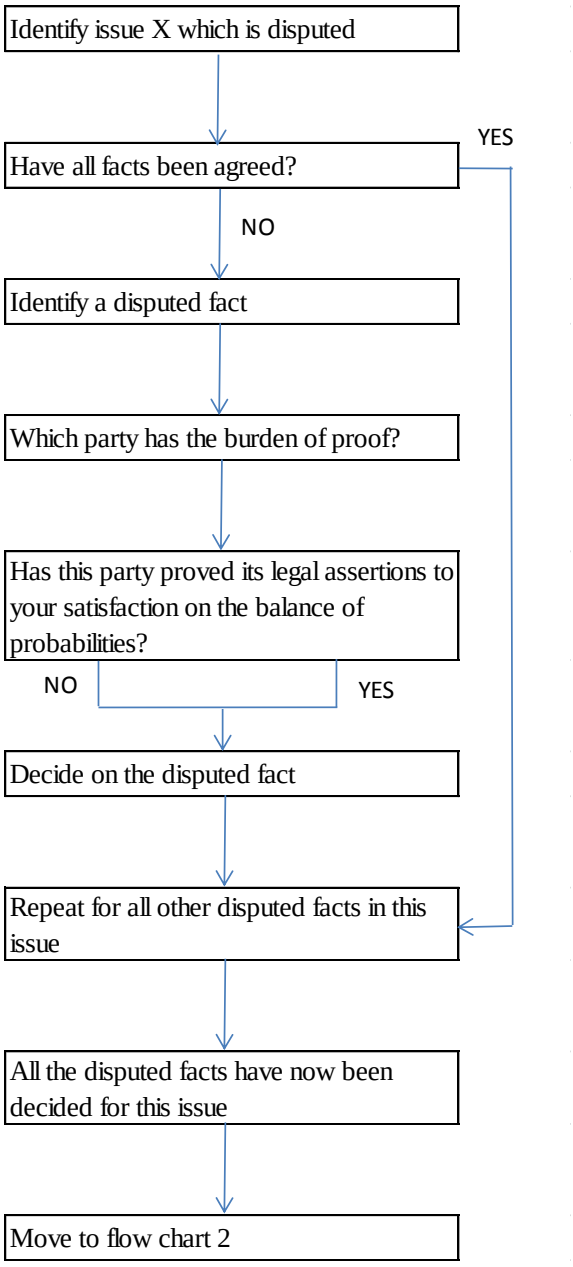

Figure 4.5 : Flow chart 1 - consideration of the facts

Flow Chart 2: Consideration of the law

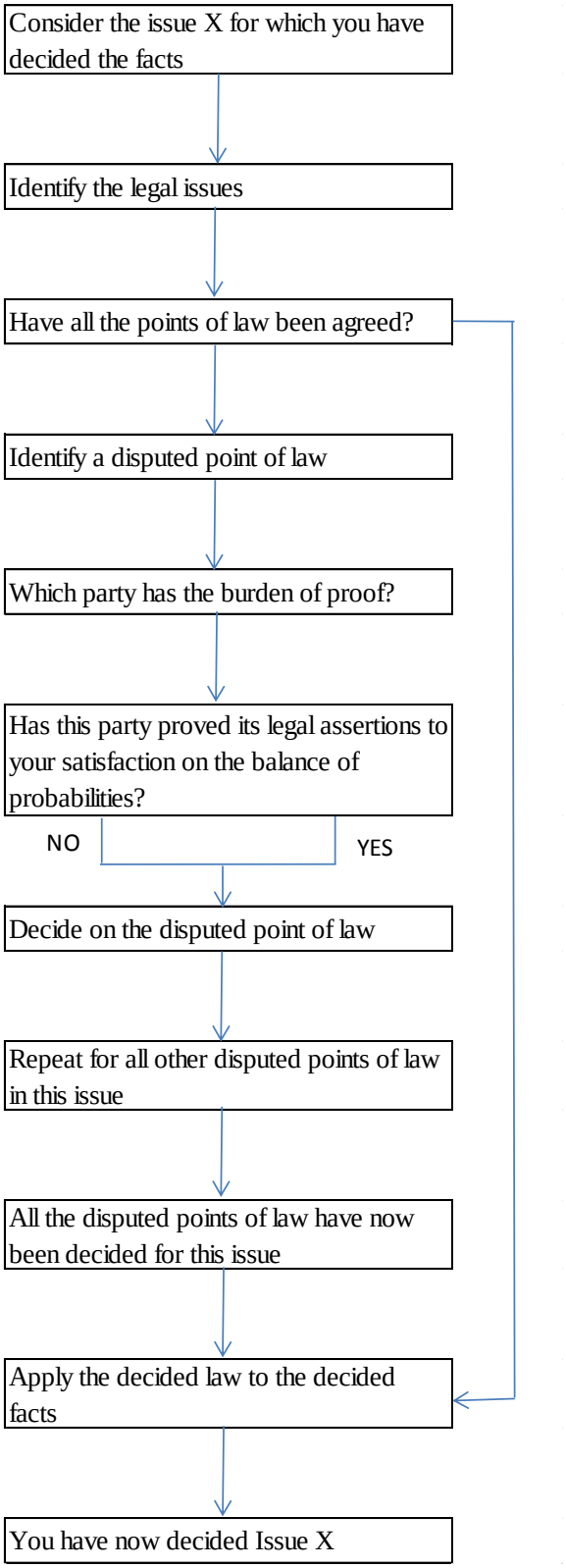

Figure 4.6 : Flow chart 2 - Consideration of the law

The decision must be explained in a clear presentation. It should start with introduction, which explains the background of the dispute, details of the parties. Then arguments and responses of each party should be presented. Finally, DB should write the decision according to the law and reasons (Bunni, 2005).

Start from the DAB's chairman receives the referral documents; DAB decides a binding decision within 84 days as in written FIDIC Clause 20 (Figure 4.7 & Figure 4.8).

Day 0	Chairman receives the referral documents.
Day 1	Chairman acknowledges receipt and confirms date for decision.
	Chairman consults with members.
Day 4	Chairman issues initial directions.
	Questions and answers on any problems of jurisdiction.
Day 14	Responding party submits response.
Day 21	Referring party submits reply to response.
	Further submissions and answers to DB questions.
Day 40	Exchange names, details and agenda for hearing.
Day 50	Site visit.
Day 51	Hearing day 1.
Day 52	Hearing day 2.
Day 59	Parties submit written closing submissions.
	DB consultation and discussions.
Day 80	DB meets to agree final wording of decision.
Day 84	Chairman issues DB decision to parties.

Figure 4.7 : Typical programme for a DB referral period

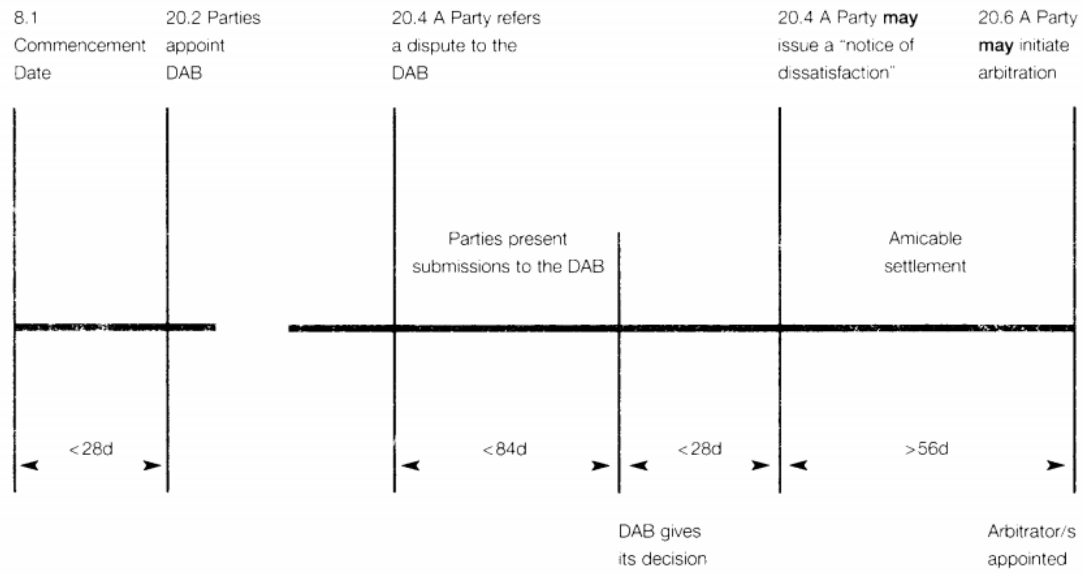

Figure 4.8 : Typical sequence of dispute events envisaged in clause 20

Even though parties do not satisfied from the results, they must obey the result and act accordingly. However, within 28 days they must give a notice of dissatisfaction. After that, they will try to resolve the settlement amicably in 56 days. If there will not meet in a common ground, they can submit to the arbitration. All these procedure of the dispute resolution with DAB is drawn in Figure 4.9 which is taken from Chern 2011.

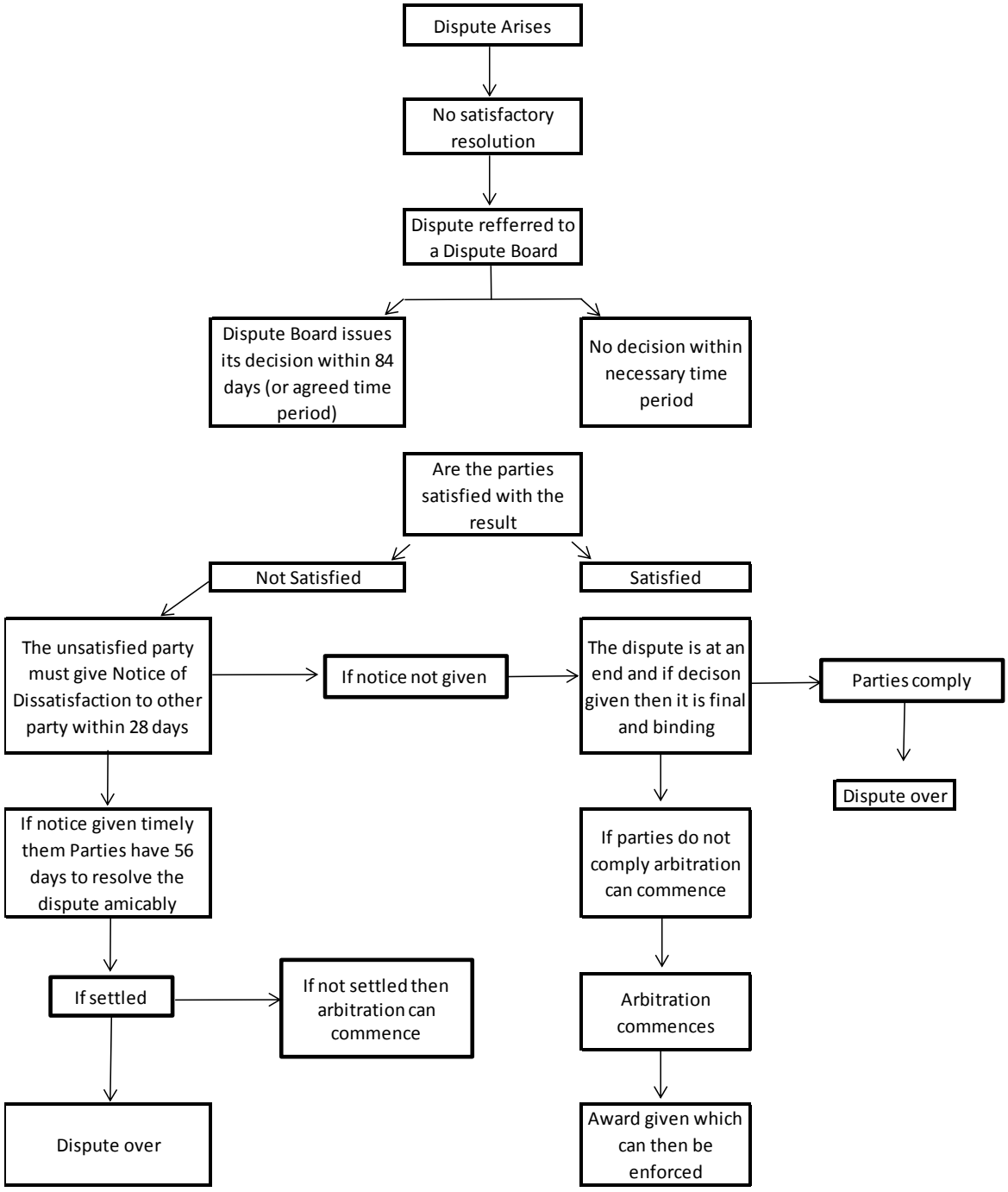

Figure 4.9 : Dispute resolution pathway

5 LITERATURE REVIEW ABOUT RISK MATRIX OF INFRASTRUCTURAL PROJECTS

Construction industry risks were mentioned in Chapter 2. In this chapter, literature review of risk matrices and infrastructural project risks will be investigated through literature reviews and case studies. Finally, in chapter 6, a risk matrix for infrastructural project will be prepared.

5.1 Literature Review of Risk Matrices

"*Risk is an unavoidable phenomenon in construction projects*" (Perera, Dhanasinghe, & Rameezdeen, 2009). Every construction types contain risks. Some of risks can be encountered by all types; while some of them are particular in some types of projects.

5.1.1 Highway project risks

Perera et al researched road construction risk with two cases (Table 5.1) in Sri Lanka:

Table 5.1 : Road construction risk cases

Characteristic	Case A	Case B
Road Classification	Class A	Class A
Name of the employer	RDA	RDA and Ministry of Highways
Length of the road	80km	95km
Construction period	24 months	36 months
The original contract sum	$10 million	$11million
Procurement Method	Traditional ad-measurement	Traditional ad-measurement

Except two delayed payment and insufficiency in the preliminaries bill, other risks were common in both cases. Both construction works stopped due to Tsunami disaster. Adverse weather affected both projects; such as unexpected weather effect

critical work and materials washed away. Late handing over of site, late approvals, problems with utility agencies caused problems in the early stages of the projects.

Project changes increased the scope of work in both projects. Road width increased, road surface changed from Double bituminous surface treatment to asphalt pavement. Unforeseen sub-surface condition and finding underground cable location were also affect projects.

Both projects exceeded the preliminary estimated funds. That caused risks since both of them were dependent to foreign funds, which were limited. Due to inflation, construction cost increased fifty percent. Changes in the labour act caused increase in salary. Fuel price increased that which effect electricity prices.

Both projects had some difficulties in obtaining road permits and using explosives in road construction and in quarry (Perera, Dhanasinghe, & Rameezdeen, 2009).

Perera et al prepared identified 23 risk sources, 21 of them occurred in both projects. They prepare a road project risk classification framework, which is shown in Figure 5.1.

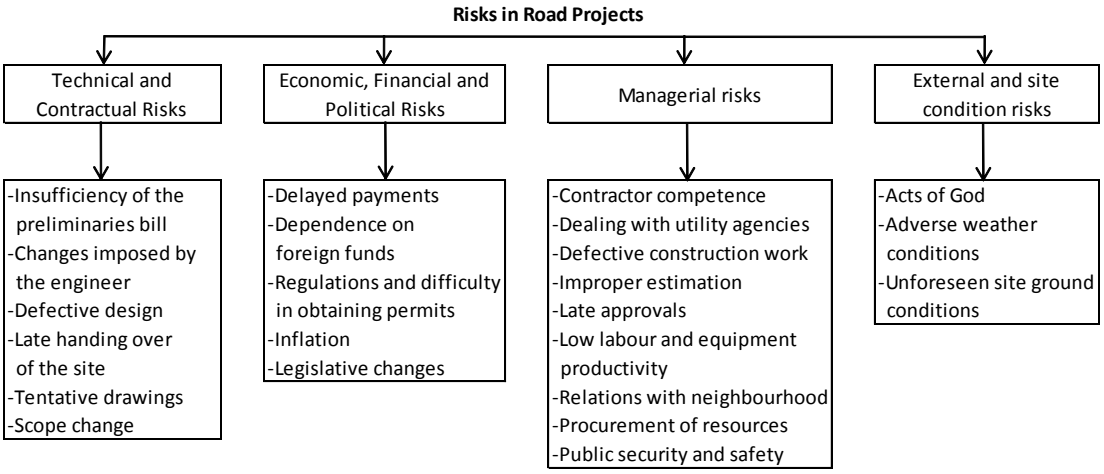

Figure 5.1 : Road project risk classification framework

Fidan (Fidan, 2008) researched a case study about infrastructural project in the United Arab Emirates. The project was a joint venture project with a Turkish company and an Arabian company. Arabian company was the leader of joint venture and responsible from the communication with client.

Linguistic differences caused communicational problems with client and other parties. Partner's lack of experience and lack of financial resources adversely affected the contractor. Cash flow could not be maintained.

Material delivery problems caused delay in the project. Also, coordination between client and company could not been maintained. Finding skilled staff was hard to find that caused decrease in work quality. Due to strike, workers stopped working for a week.

All the problems above caused four months delay and cost overrun in the project (Fidan, 2008).

Kaliba et al researched the major causes and effects of cost escalation and schedule delays of road construction industry in Zambia. In their article, they inform that 77% of highway projects in the USA encounter cost escalation. They suggest that most of the cost escalation occurs before construction starts. The reasons of them are stated by GAO/RCED as; inadequacy of site investigation causes errors in initial estimates. When a detailed project is designed with modified estimates, both schedule and cost are affected (Kaliba, Muya, & Mumba, 2009).

This article also shows that road construction projects are adversely affected mostly from bad weather; mainly heavy rainfall and floods. Secondly, scope changes come right after it. Environmental protection, mitigation cost, schedule delay and strikes follow them. Local government pressures, technical challenges and inflation are also effect project success (Kaliba, Muya, & Mumba, 2009).

In the article of *"Assessing risk and uncertainty inherent in Chinese highway projects using AHP"*, Zayed et al identify risks of highway projects and categorized them as macro level and micro level risks. Macro level risks (Figure 5.2) are company management level. This level includes of financial, political, cultural and market risks. Currency exchange rate and exchange difficulty are important because of imported materials and equipment. Political stability also affects projects. Political power effects economy and hospitality within the region. Micro level risks (Figure 5.3) are considered as project level risks and contain lots of risks (Zayed, Amer, & Pan, 2007).

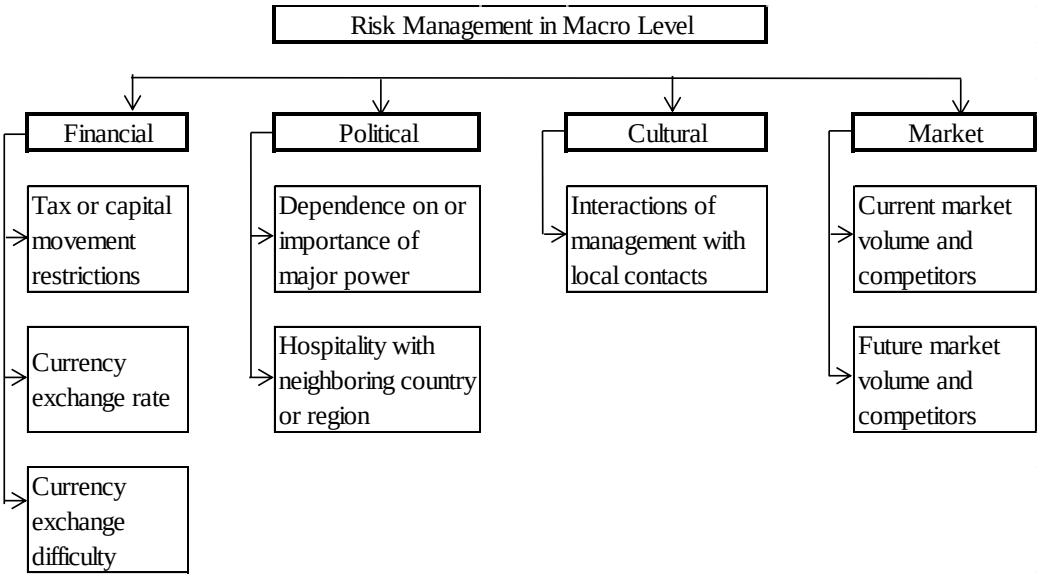

Figure 5.2 : Macro Level Risks in Highway Projects

Result of the questionnaire of Tarek et al, political risk is the most important risk to be avoided. Financial risk comes after it (Zayed, Amer, & Pan, 2007).

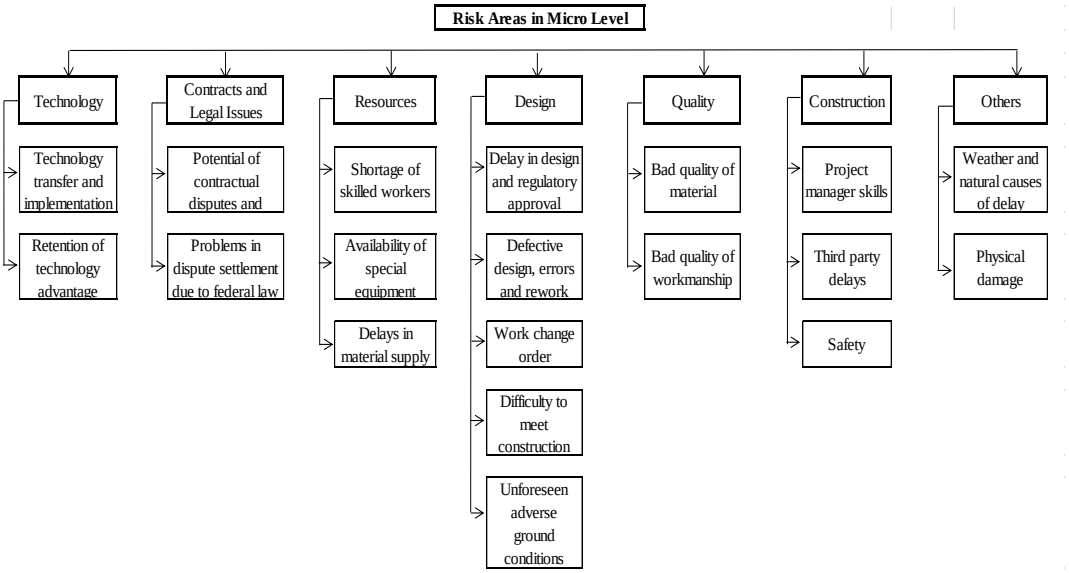

Figure 5.3 : Micro level risks in highway project

5.1.2 Subway construction risks

Underground rail project (Chaloem Ratchamongkhon Line) risks in Thailand are investigated by Ghosh and Jintanapakanont. The purpose was to identify risk factors of a complex infrastructure project. A questionnaire prepared and asked the effects of the risks factors. In the questionnaire, there were 59 risk factors however, after questionnaire it was found that 35 of them were worth to consider which are shown in Table 5.2. Title risks of 35 risk factors were financial and economic risk,

contractual and legal risk, subcontractors related risk, operational risk, safety and social risk, design risk, force majeure risk, physical risk, delay risk. When the responses from respondents were examined, it is found out that delay risk ranked first. The second was financial and economic risk, third subcontractor related risk, forth contractual and legal risk, fifth design risk, sixth force majeure risk, seventh safety and social risk, eighth physical risk, ninth operational risk (Ghosh & Jintanapakanont, 2004).

It has been reported that half of the Mass Rapid Transit (MRT) projects are delayed in developing countries. It is usually because mechanical and electrical supply management's failure of getting contract approvals in time. It has a knock effect in tunnel construction because it affects tunnel dimension, tunnel dimension affects design specification of railway carriage, and that affects its power system and communication (Ghosh & Jintanapakanont, 2004).

Crises in 1997 affected Thailand and sudden collapses of construction industry affected the MRT projects. MRT is a complex project and it involves many subcontractors. Their failures cripple the whole project and severely affect the success (Ghosh & Jintanapakanont, 2004).

Contractual and legal risk issue has also an important impact on the project. Management inability to solve disputes causes contractual delay, which may turn to project delay (Ghosh & Jintanapakanont, 2004).

Since most of the materials of the project in MRT is subcontracted, and they produced according to the design and specification; if any important material fails to meet the required specification, which causes reproduction of the material. That is time consuming and significantly affects time of completion of project (Ghosh & Jintanapakanont, 2004).

Table 5.2 : Underground rail project risks

Financial and economic risk	**Safety and social risk**
Unavailability of funds	Accidents
Financial failure of contractor	Ecological constrains
Economic disaster	Damage to persons or property
Tendered price	Pollution and safety rules
Exchange rate fluctuation	Public consultancy
Inflation	
	Design risk
Contractual and legal risk	Scope of work definition
Delay in solving contractual issues	Inadequate specification
Delay in solving disputes	Conflict of document
Delay payment on contract and extras	Design change
Change order negotiation	
	Force majeure risk
Subcontractors-related risk	War
Subcontractor failure	Act of God
Subcontractor lack of adequate number of staff	Fire and theft
Coordination of subcontractor	
Financial failure of subcontractor	**Physical risk**
	Subsurface condition of geology
Operational risk	Unforeseen site condition
	Subsurface condition of ground water
System outage	
Labor productivity	
Equipment productivity	**Delay risk**
Treatment of material removed from site	Construction delay
	Third party delays

Force majeure risk consequences were considered by the MRT management and necessary precautions have been taken at the planning stage (Ghosh & Jintanapakanont, 2004).

Operational risk was a concern at system failure and operational safety of all construction work. Furthermore, productivity of labor and equipment were found to be important aspects of that risk (Ghosh & Jintanapakanont, 2004).

5.1.3 Tunneling construction risks

Tunnel risks are defined by Reilly and Arrigoni on the South to North Great Western Diversion tunnels mega projects. They show environmental, climatic, location and physical conditions risks with observation of the case study. The predictable problems encountered during the tunnel construction are written below:

- *"Severe climatic conditions, with sub-zero temperatures for about 6 months, at high altitude*
- *Oxygen starvation, with consequent dramatic loss of human and engine performance, so maximization of mechanization and electrification is required*
- *Location problems, difficulties in access, supply, remoteness, adequate infrastructure provision for such extreme conditions*
- *Ventilation needs on such lengths & in such atmosphere*
- *High water inflows, so pumping required in all tunnels*
- *Finding excavation, muck conveyance and lining solutions, to minimize human toil, compatible with rock conditions and ventilation requirements*
- *Need to attract and preserve experienced human resources, in such conditions"* (Reilly & Arrigoni, 2004).

Moreover, there are also unpredictable problems that occurred during the construction phase which are also written below:

- *"Geological uncertainties, due to intrinsic difficulties of effective investigations at depths with covers in excess of 500 m*
- *Rock convergence phenomena, both short and long term, to be tackled for the constructability and 'final lining' aspects*
- *Many (over 20) fault zones requiring pre-treatment prior to conventional and TBM excavation*
- *Sudden water blows under pressure, due to highly fractured zones acting as aquifers (with or without gas inflow)*
- *Unstable tectonized areas, with risk of fall-outs and/or TBM blockage*
- *Earthquake zones, heavy fault zones, affecting permanent works*
- *TBM main bearing (and/or reduction gears) / main conveyor belt break-down*
- *Landslides / land mass movements, affecting either portals and surface works or interrupting supplies (including electricity)*
- *High ground temperature*
- *Rock bursts, tunnel fire, etc."* (Reilly & Arrigoni, 2004).

In their articles related with tunneling risks; Paraskevopoulou and Benardos, Oggeri and Ova, Likhitruangsilp and Ioannou remarked geological uncertainty as a primary

source of risk. It is consist of geologic variability of subsurface conditions and uncertain ground behavior. They also affected other risks similar with other infrastructural projects. Moreover, Likhitruangsilp and Ioannou categorized all tunneling risk factors, which can be shown in Table 5.3.

Table 5.3 : Tunnelling project risks

Tunnelling Risk Factors	
Economics, Politics and Law	**Construction Operation and Technique**
Variation of construction material prices	Inappropriate construction method
Fluctuation currency exchange rate	Inappropriate construction plan
Changes in legislation policy and regulation	Poor quality control during construction
	Unavailable or poor quality material and equipment
Force Majeure	Inappropriate measure of cosntruction waste disposal
Adverse weather condition	Unsafe work
Natural disasters	Action leading to pollution
Force majeure resulting from humans	
	Design
Physical and Construction Site	Omission and error in design
Unforeseen site conditions	Change in design
Differing site conditions	Incomplete drawing and technical specification
Inadequate site investigation	
Misinterpretation of site information provided by the owner	**Construction Contract**
Problems about land expropriation and acquisition	Delay in dispute resolution
Delay in site delivery	Delay in payment
Relocation of existing utilities and ground settlement	Change in work
	Delay in negotiation of change order
Project Personnel	Variation of contract and actual work amount
Delay in approval by owner and owner's representative	
Poor qualifications of engineer	
Incompetent contractor, subcontractor and supplier	
Incompetent workforces	
Poor coordination between onsite personnel	
Financial problems of the contractor	

5.1.4 Bridge construction risks

Lie and Zou prepared a risk matrix for infrastructural project by considering other articles. (See Appendix B). Moreover, Choudhry et al defined bridge construction risks.

When all matrices are examined, it can be seen that most of the risks are similar in every construction projects. However, even if it looks that way, the occurrences and impacts of some types of risks are different infrastructural projects. There are also some unique risks in infrastructural projects.

Table 5.4 : Bridge construction risks

Bridge Construction Risks	
Financial risks	**Management risks**
Unavailability of funds	Inadequate project planning
Inflation	Insufficient engineers and specialists
Escalation of material prices	Lack of coordination
Financial delays	Poor site management and supervision
Financial failure of the contractor	Strikes and theft
Economic disaster	Incompetent subcontractors
Contractual risks	**Construction risks**
Change in project scope and change orders	Construction delays
Contractual abnormalities	Defective work and quality issues
Disputes and claims	Insufficient technology
Unrealistic cost estimates and schedules	Low labor productivity
	Material shortage
Design risks	Excessive inspections and audits
Design changes	Unclear scope of work
Incomplete designs	Unexpected site conditions, such as unanticipated dewatering or encountering rock that has to be removed
Inadequate site investigations	Unexpected weather
Health and safety risks	Work interruptions and lack of space
Accidents	
Equipment and property damage	**External risks**
Fatalities	Delay in approval from regulatory bodies
	Political instability
	Third-party delays
	Unstable government policies
	Unavailability of land and right of way that restricts access

6 PREPARATION AND ASESSMENT OF RISK MATRIX AND QUESTIONNAIRE

6.1 Preparation of Infrastructural Risk Matrix

In chapter 5, infrastructural project risks are investigated from various sources. It is found that, there are lots of risks in construction projects. Even though most of the risks are similar in every construction type, there are certain risks that are crucial in infrastructural projects. World Bank's matrixes of road risk distribution and Inuvik to Tuktoyaktuk Highway (ITH) Project risk matrix (Appendix C) are also examined moreover to the chapter 5.

In this thesis, ADR effects to settle the risk related disputes are going to be investigated on risks. Therefore, specific risks are selected for our matrix that ADR might affect. For example, ADR does not have any affect if there is a political corruption risk or relationship between company's country and project country. That is why those kinds of risks have not selected.

Risks are categorized in design relevant risk, sire relevant risk, construction risk, financial risk, permit and approval risk and contractual risk.

6.1.1 Design relevant risk matrix

This section of questionnaire matrix is prepared to understand the affects of pre-construction phase to the success of an infrastructural project, additionally, to see the ADR effect during design phase risks. The design relevant risks selected for the questionnaire are;

- Inadequacy of project site investigation
- Detailed design issue delays by the Employer (in case design responsibility is not with the construction company)
- Detailed design approval delays (in case design responsibility is with the construction company)
- Design and construction standard changes during construction period

- As-built design delays
- Defective design

6.1.2 Site relevant risk matrix

Site relevant risks compose pre-construction phase to post-construction phase. Lack of information about site is a good definition for most of the site risk subjects. Risks selected for site relevant risk matrix are;

- Expropriation delays by the Employer and problems
- Additional expropriation delays by the Employer for permanent purposes for project
- Site handover problems by the Employer for temporary construction purposes
- Relocation of municipal services i.e. utilities (pipelines, electrical lines etc.)
- Lack of information about existing site conditions
- Conditions /defects of existing buildings (within the Site and around the Site)
- Archaeological findings
- Construction activity that results in contamination (chemicals mix drainage water, using large quantities of grouting agent etc.)
- Road Access (for local road or worksite access) and temporary traffic diversions
- Site Safety (HSE)

6.1.3 Construction risk matrix

Construction risks are encountered during construction phase. This phase is interconnected with every party in the project. For infrastructural projects, ground conditions risks possess more importance than for other type of projects. Ground conditions are surrounded with unknown and unknown is strongly related with risk therefore, infrastructure is a construction type that highly exposed to underground condition construction risks, since the projects usually are highly related with earth.

There are also other types of construction risk affect an infrastructural project. All list used in the matrix is shown below:

- Differing geotechnical conditions (ground characterization, complex and unpredictable ground conditions, measurement problems in rock)
- Measurement problems related to ground water level

- Supply of material and equipment availability
- Difficulty to obtain Excavated Material disposal area
- Skilled workforce unavailability
- Delay caused by third parties (permits & approvals)
- Project management/interface delays (with Third Parties)
- Changes (Variations) in scope of Work by owner
- Construction/ Design changes (variations) by the Employer
- Construction acceleration (by the owner, government pressure etc.)
- Inadequate and improper insurance
- Subcontractor problems (inadequacy etc.)
- Site health and safety
- Disputes between designer/contractor/professional team
- Adverse weather conditions
- Force majeure (war, earthquake flood etc.)

6.1.4 Financial risk matrix

This risk has a direct impact of project success. Financial risk might be triggered from different kind of condition for instance; political instability to labor strikes.

- High inflation
- Delayed payments (cash flow problems)
- Fluctuation in material and equipment prices
- Fluctuation in labor prices

6.1.5 Permit and approval risk matrix

This risk is usually related with government bodies. Corruption in government and excessive bureaucracy affects to get permits and approvals. For the matrix;

- Municipal Approvals
- Complexities of administrative structures
- Inexperience of administrative personnel
- Delay in approval from regular bodies

6.1.6 Contractual risk matrix

To be able to control the contractual risks; following questions will asked to the questionnaire respondants:

- Ambiguities in conditions of contract
- Disagreement on interpretation of conditions of contract
- Client's excessive demands and variations

6.2 Methodology

The questionnaire is composed of risk assessment and dispute resolution parts. First part is related with risk estimation and evaluation. Second part is asks effects of the dispute resolution methods. The second part of the questionnaire is taken from a thesis which was prepared by the students of Assoc. Dr. Deniz Artan İlter in her leadership in 2012.

The questionaire is filled by construction companies' staff personnel who have minimum 5 years experience in contract and risk related areas. Moreover, companies of these personnel are well-known companies, which are working in infrastructure projects for minimum 25 years, and minimum turnover of the company among themhas 100 million dollars. They have completed and ongoing projects within Turkey, Middle East and Arabic Countries, Commonwealth of Independent States Countries and North African Countries.

First part of questionnaire composed of risks that are categorized in chapter 5. Risk rating of those risks are found by asking probability of occurrence of risk (P) and impact (I) of that risk when it is occurred.

Furthermore, alternative dispute resolution effects of risks that caused dispute is also asked. Persons assigned a rating to 1 to 5 to show the effect. Hence, ADR's dispute resolution effectiveness is purposed to be found.

To be able to check the reliability of the questionnaire, a reliability analysis will be used. IBM SPSS Software will be used to do the analysis.

6.3 Project Risk Rating (PRR) Methodology

Baccarini and Archer defines the aim of the PRR method is *"to assess the relative level of risk of contracting projects"* (Baccarini & Archer, 2001). PRR methodology is used to measure the risk by its occurrence and impact. The formula requires two variables:

- Probability of occurrence of risk, P;
- Impact of the risk, I;

$$R = P \times I \quad (1)$$

This technique is common to assess construction project risks. Banaitiene and Banaitis used multiplication of occurrece of risk and impact to find out risk rating (R). Moreover,PRR is also used by Chande and Inovik to Tuktayuk Highway project risk matrix.

6.4 Reliability Analysis

For Risk Assessment part of the questionnaire, reliability analysis test is conducted to check the consistency of the questionnaire.

Cronbach' s Alphacoefficient is used to measure of internal consistency for the analysis. If the Cronbach Alpha value is above 0,70, the results are good (Table 6.1).

Table 6.1 : Cronbach's alpha coefficient

Cronbach's alpha	**Internal consistency**
$\alpha \geq 0.9$	Excellent (High-Stakes testing)
$0.7 \leq \alpha < 0.9$	Good (Low-Stakes testing)
$0.6 \leq \alpha < 0.7$	Acceptable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

The analysis performed with IBM SPSS Software. When the results are checked in Table 6.2, except financial risks impact section, the questionnaire seems reliable. For

financial impact section, when the last question in that section deleted, the coefficient increases to 0,790. All the reliability test results are attached at the end of the thesis as Appendix E.

Table 6.2 : Questionnaire reliability test results

RISK GROUPS	Cronbach's Alpha		
	Rate	**Impact**	**ADR Effect**
Design Risks	0,808	0,692	0,928
Site Risks	0,870	0,691	0,870
Construction Risks	0,953	0,756	0,727
Financial Risks	0,800	0,546	0,828
Permit and Approval Risks	0,841	0,836	0,823
Contractual Risks	0,861	0,742	0,652

6.5 Questionnaire Results and Assessment

11 experienced personnel from contractor and consultant companies filled the questionnaire (See Appendix D). First part of the questionnaire was related with project risks and persons was asked to fill probability of occurrence of risk, impact of the risk and ADR effect to settle the issue if any dispute arises by giving numbers from 1 to 5 to each space.

Results of the questionnaire is analyzed as in the Table 6.3 below. The rating 1.00 to 4,00 is considered low risk rating, 4,01 to 14,99 is considered medium and 15 and higher has high risk rating.

Table 6.3 : Probability and impact matrix

		RISK IMPACT				
		Ineffective	Less effective	Average effective	Effective	Very effective
PROBABILITY	Almost Never	LOW	LOW	LOW	MEDIUM	MEDIUM
	Rarely	LOW	LOW	MEDIUM	MEDIUM	MEDIUM
	Sometimes	LOW	MEDIUM	MEDIUM	MEDIUM	HIGH
	Usually	MEDIUM	MEDIUM	MEDIUM	HIGH	HIGH
	Always	MEDIUM	MEDIUM	HIGH	HIGH	HIGH

6.5.1 Risk assessment part of the questionnaire

Design phase has crutial effect on the success of the project. Experts, who filled questionnaire, complain about the limited time and resources in this phase. Consequently, projects may expose to design risks mentioned in Table 6.4. It shows that, missing or wrong information in geotechnical and other data has more risk rating than others. It is nearly boundary in of high-risk rating. Defective design risk rating follows. Experts suggest to be very careful on design phase and sheck every step to avoid the defective designs.

ADR seems usually effective to settle the design risk issues. As-built design delays first rank but they all are close to eachother except inadequecy of project site investigation.

Table 6.4 : Design risks from questionnaire

DESIGN RISKS	AVE. PROB.	AVE. IMPACT	AVE. RISK RATING	ADR EFFECT
Missing Information in geotechnical and other data	3,10	4,70	14,80	3,67
Defective design	2,80	4,50	12,40	3,44
Detailed design issue delays by the Employer (in case design responsibility is not with the construction company)	2,82	3,82	11,00	3,70
Inadequacy of project site investigation	2,64	4,09	10,73	2,80
Detailed design approval delays (in case design responsibility is with the construction company)	2,60	3,70	9,80	3,56
Design and construction standard changes during construction period	2,60	3,40	9,30	3,56
As-built design delays	2,60	3,60	9,10	3,89

Site risks evaluated with 10 different risk sources in the Table 6.5. These risk sources subjects are gathering around uncertainty, which causes delays, environmental issues and safety issues. The most risky source is chosen expropriation delays by the employer and problem is the most severe risk for the project. Its 16.27 rating puts it into high-risk rating status. It also has the highest impact by far, if it occurs. Relocation of municipal services is also in the high-risk rating.

During the interview, most of the experts indicated thatinfrastructural transportation projects are usually exposed to temprorary and permanent expropriation delays. This problem adversely effects the project duration and consequently its budget. Furtunately, ADR is effective to settle these kinds of issues with 4.30 and 4.40 average values respectively.

Table 6.5 : Site risks from questionnaire

SITE RISKS	AVE. PROB.	AVE. IMPACT	AVE. RISK RATING	ADR EFFECT
Expropriation delays by the Employer and problems	3,55	4,45	16,27	4,30
Relocation of municipal services i.e. utilities (pipelines, electrical lines etc.)	3,73	3,91	15,00	3,30
Additional expropriation delays by the Employer for permanent purposes for project	3,27	3,91	13,45	4,40
Site handover problems by the Employer for temporary construction purposes	3,18	3,64	12,00	3,90
Lack of information about existing site conditions	3,09	3,55	11,00	3,60
Road Access (for local road or worksite access) and temporary traffic diversions	3,09	3,73	10,82	3,60
Site Safety (HSE)	2,82	3,82	10,82	3,60
Conditions /defects of existing buildings (within the Site and around the Site)	2,82	3,73	10,45	3,30
Archaeological findings	2,18	4,00	8,55	3,60
Construction activity that results in contamination (chemicals mix drainage water, using large quantities of grouting agent etc.)	2,45	3,45	8,09	3,10

Construction risk part composes 16 risk sources. Three of them are in high rating risk, which can be seen in Table 6.6. When those risks are checked, it can be seen that all three risks occur, not because of contractor. They occur because of external problems like; scope changes, delayed approvals and political pressures.

Table 6.6 : Construction risks from questionnaire

CONSTRUCTION RISK	AVE. PROB.	AVE. IMPACT	AVE. RISK RATING	ADR EFFECT
Construction acceleration (by the owner, government pressure etc.)	3,91	4,27	17,00	3,60
Delay caused by third parties (permits & approvals)	3,82	4,18	16,45	4,00
Changes (Variations) in scope of Work by owner	3,55	4,09	15,18	4,10
Construction/ Design changes (variations) by the Employer	3,18	4,09	13,45	3,50
Disputes between designer/contractor/professional team	3,55	3,82	13,27	3,40
Differing geotechnical conditions (ground characterization, complex and unpredictable ground conditions, measurement problems in rock)	3,09	4,09	13,18	3,10
Measurement problems related to ground water level	3,27	3,64	12,00	3,20
Project management/interface delays (with Third Parties)	3,20	3,80	11,55	3,56
Subcontractor problems (inadequency etc.)	3,18	3,73	11,45	3,00
Site health and safety	2,82	3,91	11,00	3,20
Difficulty to obtain Excavated Material disposal area	3,09	3,27	10,73	3,40
Supply of material and equipment availability	2,64	3,36	9,45	2,60
Force majeure (war, earthquake flood etc.)	2,09	3,91	8,00	2,80
Inadequate and improper insurance	2,27	3,36	7,82	2,30
Adverse weather conditions	2,73	2,73	7,73	2,60
Skilled workforce unavailability	2,27	2,91	7,55	2,30

Apart from these three sources, experts draw attention to differing geotechnical conditions for infrastructural projects. According to them, this risk is directly related to time and cost of the project. Contractor and owner usually have claims and disputes because of this issue.

ADR effect to financial risks is not as good as the other risk sources (Table 6.7). Questionnaire results show that delayed payments take the first place in risk ratings. Both its probability and occurrence are higher than other financial risk sources. However, ADR is more effective to deal with this risk source. Infrastructure transport projects usually lean on machinery rather than labour and requires huge amount of material. That is why; fluctuation in material and equipment prices adversely effects the project. Therefore, it also gets the second place in financial risk rating in the questionnaire.

Table 6.7 : Financial risks from questionnaire

FINANCIAL RISKS	AVE. PROB.	AVE. IMPACT	AVE. RISK RATING	ADR EFFECT
Delayed payments (cash flow problems)	3,64	4,27	15,73	3,20
Fluctuation in material and equipment prices	3,55	3,91	14,18	2,80
High inflation	2,91	3,73	10,91	2,30
Fluctuation in labour prices	2,36	3,00	7,55	2,50

Bureocracy may cripple the projects with their complex administrative structures. Moreover, inexperience administrative personnel may adversely affect the project. In Table 6.8, delay in approval from regular bodies risk has a high probability, which means it usually occurs in infrastructure transport projects.

Table 6.8 : Permits and approval risks from questionnaire

PERMIT AND APPROVAL RISKS	AVE. PROB.	AVE. IMPACT	AVE. RISK RATING	ADR EFFECT
Delay in approval from regular bodies	3,82	4,18	15,91	3,70
Municipal Approvals	3,55	3,91	14,09	3,40
Inexperience of administrative personnel	3,09	3,64	11,64	2,90
Complexities of administrative structures	3,18	3,18	10,55	3,00

ADR offers good dispute solution system in disagreement on interpretation of conditions of contract (Table 6.9).

Table 6.9 : Contractual risks from questionnaire

CONTRACTUAL RISKS	AVE. PROB.	AVE. IMPACT	AVE. RISK RATING	ADR EFFECT
Disagreement on interpretation of conditions of contract	3,27	3,73	12,82	4,10
Ambiguities in conditions of contract	3,09	3,64	11,73	3,30
Client's excessive demands and variations	3,00	3,27	10,55	3,00

6.5.2 Dispute resolution part of the questionnaire

In this section, the person participate in the questionnaire gave number 1-5 for the related questions. This part shows of the companies' angle to the dispute resolution types.

Table 6.10 : Contract type usage

CONTRACT TYPES	RATING
Public Procurement Law	3.60
Municipality Contracts	2.20
FIDIC Standard Contract Types	3.90
World Bank Standard Contract Types	2.00
AIA Standard Contract Types	0.50
Private Contracts prepared by parties	3.00

The usage of the contract types by the companies that attended to the questionnaire is metioned in the Table 6.10. According to the Table 6.10, FIDIC and Public Procurement Law are frequently used by the companies. When a dispute arises, parties usually try to solve them by negotiations. Litigation follows the negotiation and then arbitration (Table 6.11). The usage of other types of dispute resolutions are very low even though the companies' large-scale projects. However, when the performances of the dispute resolution types are examined from Table 6.12, it is obvious that alternative dispute resolution methods satisfy the parties more then classical methods.

Table 6.11 : Dispute resolution types usage

DISPUTE RESOLUTION TYPES	USAGE RATING
Litigation	3.30
Arbitration	3.10
Dispute Adjudication/Resolution Boards (DAB/DRB)	1.40
Adjudication	1.20
Expert Fact Finding/Appraisal	2.50
Executive tribunal	1.10
Mediation	1.00
Negotiation	3.60

Even though, respondents are pleased with these methods, Table 6.13 shows the reasons why parties do not choose ADR as a dispute resolution method. According to the table, effectiveness is questioned by the parties. Furthermore, table shows that, lack of information and companies'institutinalization are other reasonsfor parties to not to choose ADR.

Table 6.12 : Dispute resolution types satisfaction table

DISPUTE RESOLUTION TYPES	Performance Satisfaction Rating
Litigation	3.20
Arbitration	3.45
Dispute Adjudication/Resolution Boards (DAB/DRB)	4.29
Adjudication	3.83
Expert Fact Finding/Appraisal	3.38
Executive tribunal	3.20
Mediation	3.20
Negotiation	4.00

ADR process is flexible, fast to resolve the dispute, keeps the good faith between the parties (Table 6.14). Responded experts find them effective.

Table 6.13 : Reasons to not to choose ADR

REASONS TO NOT TO CHOOSE ADR	RATING
Thought of inefficiency of non bounding (consensual) methods	3,82
Concern about the effectiveness of these methods	3,64
These methods are not known enough in the construction industry	3,64
Lack of information and education about these methods	3,55
Lack of institutionalization and corporate infrastructure about these methods (unfeasibility of corporation and consultancy services)	3,55
Concern about the performability of the results by the result of these methods	3,45
Slowness of the adaptation of innovative practices	3,36
Dispute involves legal issues	3,36
Fear of the reason of usage of these methods as a tactic to delay payments	3,27
Problems about communication with other party	3,09

Table 6.14 : Reasons to choose ADR

REASONS TO CHOOSE ADR	RATING
These types accelerate the duration of dispute resolution process	4,09
These types create an opportunity to settle the dispute with experienced and neutral individuals	4,00
These types protect the boundaries between parties	3,91
Simplicity to use these types	3,82
These methods increase the reconciliation between parties	3,82
These types lower the costs of dispute resolution process	3,73
These methods increase probability to satisfy parties commercially	3,73
Process of these methods are flexible and they are under control of parties	3,55
These methods are suitable for multilateral dispute resolution	3,55
These types give right to reject the experienced and neutral individual	3,45
These types let spare time for dispute resolution to upper management of the parties	3,36
These methods lower the need of legal adviser/lawyers	3,27
Avoidance of the local courts or arbitration due to lack knowledge of legislation in project's country	3,27
Dispute comprise from technical issues	3,00
These types keep the information and documents classified	2,73
Avoidance of the local courts or arbitration due to lack of documentation of dispute	2,64

7 CONCLUSION

Construction industry is a very complex industry. It highly depends on labor and many disciplines needs to work together. A project, which has these much of input creates many uncertainties and risks from the beginning to the end of a project.

Infrastructure construction projects have an important place developing companies. For instance, in Turkey, 85 billion Dollars has invested to transportation in last 12 years. These investments have political importance and political parties use them as election commitment.

In the thesis, it has seen that infrastructure construction companies, which work in Turkey, Middle East and Arabic countries, Commonwealth of independent state countries, North African countries mostly, use FIDIC Standard contract types, Public Procurement Law, Private Contracts and World Bank contracts respectively.

It has been found out that, infrastructural projects highly exposed to some kinds of risks usually related with owner who is usually government and government bodies. Construction acceleration by the owner or government pressures, delay caused by third parties for permit and approvals, expropriation delays are some important risks that effect project success.

When those risks turn out to disputes, parties try to solve them usually with litigation and arbitration. However, Alternative Dispute Resolution methods do not used enough even if they managed to get good results. The main reason of this issue is lack of knowledge of companies about those methods. 40% of the respondents in questionnaire left ADR methods blank in the question of usage frequency of dispute resolution types.

Questionnaire results ADR methods have better satisfaction than litigation and arbitration. It lowers the cost and accelerates the duration of the dispute resolution process that gives crucial advantage to project. ADR process protects the boundaries between parties and keeps the good relations between them. ADR composes of highly technical skilled and experienced personnel to settle the dispute rather than a

judge who has limited technical knowledge. ADR is a flexible process and they are under control of parties.

To sum up; infrastructural construction industry composes vast and complex projects. They have a great amount of risks and uncertainities from the design stage to handing over. To deal with those risks professionally, especially transportation infrastructure construction industry needs gravitate to FIDIC Contract types and ADR methods. Alternative dispute resolution methods provide faster and cheaper resolution. However, infrastructure construction companies have lack of information and some timidity about them. This thesis shows that, companies who used ADR methods, satisfied more than arbitration and litigation. The ones that used ADR want to use them again in their following projects.

To develope the ADR techniques in Turkey, Turkish consultants need to seek experience and become ADR members. Contractors need to learn how to use ADR and be positive about selecting and using them. Parties need to work together and respect to the process.

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APPENDICES

APPENDIX A: Dispute Adjudication Board Meeting Agenda

APPENDIX A: Dispute Adjudication Board Meeting Agenda

First Meeting of the Dispute Adjudication Board

Project: .....
Date of meeting: ..... ***Place of meeting:*** ..... ***Venue:***.....
Time at commencement of meeting: .....
Time at end of meeting:.....

Names of attendees:	***Position***	***Affiliation***	***Contact numbers***	***Addresses***
1. ... 2. ... 3. ...	....	....	....	....

Item No.	Topic	Action by
1.	Attendance/Introductions	DB
2.	Approval of Draft Agenda	All
3.	Review of DB Role/Conditions of Contract, Guidelines, Procedure and Agreement: (a) Purpose of DB and its advantages (b) Relationship of DB to the contract dispute resolution mechanism (c) Periodic DB meetings and dates (d) Procedure for informal opinions (e) Procedure for formal decisions and hearings (f) Obligations of the parties and the DB	DB
4.	Administrative matters: (a) Details of contact with each party and person in charge (b) Ensure that the necessary formalities are in place (c) DB meeting minutes (d) Copies of periodic progress reports and key contract documents for DB members • List of the personnel involved and their job titles • Invoicing procedures relating to fees and expenses	DB
5.	Project familiarisation briefing: (a) Contractor organisation; key project and personnel and their roles (b) Employer organisation; key project personnel and their roles (c) Description/scope/contract price/major items of work (d) Unique features (e) Schedule: network analysis, contract completion date (f) Milestones and targets	The Parties
6.	Contractor's discussion of (a) Current status and problems, if any (b) Projected schedule for next three months (i) Design (ii) Construction (c) Pending issues, if any (d) Anticipated issues and potential problems, if any	Contractor
7.	Employer's discussion of (a) Work progress (i) Design (ii) Construction (b) Pending issues (if any) (c) Anticipated issues (if any) (d) Perceived problem areas	Employer
8.	Other items as advised beforehand	All
9.	Are meetings required? If so, set date/time of next meeting	All
10.	Site visits	All

APPENDIX B: Transportation infrastructure project risk matrix collected from articles

Risk category	*Risk factors*	*Singh et al, 2006,India*	*Li et al 2005, UK*	*Lemos, et al, 2004, Portugal*	*Grimsey, et al, 2002, UK*	*WANG, et al, 2000, China*	*Akintoye, et al, 1998, UK*	*Total*
Feasibility study	Environmental pollution	√	√	√	√	√	√	6
	Risk of not-permit/ approval	√	√	√		√	√	5
	Land acquisition and compensation problems	√	√	√		√	√	5
	Public opposition	√	√			√	√	4
	Pre-investment risk	√		√			√	3
	Exclusivity, (i.e. not providing second facility		√	√		√		3
	Level of demand for project		√	√			√	3
	Political opposition/hostility		√			√		2
	Poor public decision-making process		√		√			2
Financing	Interest rate volatility	√	√	√	√	√	√	6
	Inflation rate volatility	√	√	√	√	√	√	6
	Legislation change	√	√	√	√	√	√	6
	Low financial attraction of project to investors	√	√	√	√		√	5
	High finance costs		√	√	√	√	√	5
	Poor financial market	√	√	√			√	4
Design	Design deficiency	√	√	√	√		√	5
	Too many design changes	√	√	√	√		√	4
	Unproven engineering techniques		√		√			1
Construction	Construction cost overrun	√	√	√	√	√	√	6
	Delay completion	√	√	√	√	√	√	6

Risk category	*Risk factors*	*Singh et al, 2006,India*	*Li et al 2005, UK*	*Lemos, et al, 2004, Portugal*	*Grimsey, et al, 2002, UK*	*WANG, et al, 2000, China*	*Akintoye, et al, 1998, UK*	*Total*
	Environmental pollution	√	√	√	√	√	√	6
	interest rate volatility	√	√	√	√	√	√	6
	Inflation rate volatility	√	√	√	√	√	√	6
	Difficulties in land acquisition and compensation	√	√	√		√	√	5
	Too many late design variation	√	√	√		√	√	5
	Non-reliability and creditworthiness of local parties	√	√		√	√	√	5
	public opposition	√	√			√	√	4
	Construction force majeure events	√	√		√	√		4
	Poor quality workmanship		√			√	√	3
	Excessive contract variation		√			√	√	3
	non-availability of material / Labour		√	√		√		3
	Insolvency / default of subcontractor or suppliers		√			√	√	3
	Bad weather	√	√			√		3
	Poor Geotechnical conditions		√			√		2
Operation	Operation revenues below expectation	√	√	√	√	√	√	6
	Fluctuating market demand	√	√	√	√	√	√	6
	Operation / maintenance cost overrun	√	√	√	√	√	√	6
	Environmental pollution	√	√	√	√	√	√	6
	interest rate volatility	√	√	√	√	√	√	6
	Inflation rate volatility	√	√	√	√	√	√	6
	Legislation change	√	√	√	√	√	√	6

Risk category	*Risk factors*	*Singh et al, 2006,India*	*Li et al 2005, UK*	*Lemos, et al, 2004, Portugal*	*Grimsey, et al, 2002, UK*	*WANG, et al, 2000, China*	*Akintoye, et al, 1998, UK*	*Total*
	Lack of reliability and creditworthiness of local parties	√	√	√	√	√	√	6
	Low productivity during operation	√	√	√	√		√	5
	Technology risk	√	√		√	√	√	5
	public opposition because of high product/service price/fees	√	√			√	√	4
	Operator's inability	√	√			√	√	4
	Exclusivity, (i.e. not second facility)		√	√		√		3
	Political force majeure events	√	√			√		3
	Debt risk	√					√	2
	Expropriation, revoke, sequestration of assets		√			√		2
	Prolonged downtime during operation			√		√		2
Transfer	low residual value		√	√			√	3
	Transmission failure			√		√		2

APPENDIX C: Inuvik to Tuktoyaktuk Highway (ITH) Project Risk Matrix

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
Project Management Risks									
1	Project Management	Experienced PM team and consultants required	Project can be complex with many technical issues, legal issues, regulatory challenges and budget challenges. An experienced team with sufficient depth and knowledge is required.	DOT GNWT	2	5	10	The department to assign a team to manage the issues and have the proper checks and balances to ensure proper oversight. The DOT to ensure any proponent and consultants has the proper resources in place to take on the project. FMB, DM Infrastructure Committee and the ITH Oversight Committee can all fulfill an oversight function.	The project team needs to assess all risk and all options. Clear contingency plans to be developed, prepared and costed. Oversight must be timely and effective.
2	Contractor Competencies	Experience of Contractors and Sub Contractors	The Contractor and Sub Contractors lack experience and knowledge reference best practises regarding road and bridge construction. Inexperience leads to errors and potential violations of regulatory conditions	DOT GNWT	3	4	12	Develop an Integrated Team approach and review all aspects of the project including design, construction sequence and risks. Pre-qualification of all Contractors and sub-contractors. DOT to host a series of focused sessions to share lessons learned on past projects. Recent experiences at source 177 has given the DOT a good sense of future issues. Contractors performance was measured and found acceptable.	Studies of the Construction Industry pinpoint Contractor and Sub Contractor poor knowledge of best practises or that they may be unfamiliar with some aspects of construction. While pre-qualification is a mitigation measure in itself, often questionable competencies do not become obvious until the road construction as well as its bridging and by-passing of obstacles is well into the project. There are not many contractors or sub-contractors with experience in building roads in a permafrost environment.
3	Project Administration	Contractors and Subs are Poor Administrators	This project has a number of moving parts. Both the Contractor and the Sub Contractors must follow sound administrative practices. Work, site investigations, surveys, soil sample results and invoicing must be meticulously documented and filed. Many Contractors and Subs are proud of their construction techniques but may fall woefully short in organizing administration.	Contractor Sub-Contractors DOT GNWT	3	3	6	Integrated Team to address protocols and expectations regarding administration and document control. DOT to host sessions on lesson learned. DOT and Human Resources to assist in attracting experienced and competent administrative staff for Contractors and Sub Contractors.	Research indicates that within the construction industry there is a reported significant incidence of errors resulting in change orders with associated costs, delays and issue disputes directly attributable to poor front of office administration. Document control is vital.

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
4	Initial Cost Estimates and Budgets are used to make early decisions	Important to ensure accurate cost estimates as under bidding is a major concern.	The project is in the early stages and it is important to evaluate the accuracy of estimates available at this time; funding is being secured at this stage and if enough contingencies are not built in or the estimates are not complete; it may be high risk in the later stages of the project. As this is a joint project with the Feds committing to $200m and the GNWT committing $99m- all cost estimates must be as accurate as possible.	DOT GNWT	3	5	15	The Department must evaluate current estimates and make sure that enough contingencies are built in the cost estimates. The DOT should have at least three independent costs prepared. The GWNT has notified the feds and the press the project is estimated at $299m. Design remains at 85% and risks remain. There is current getoech works underway and work on the 100% to give the GNWT more confidence.	Under budget may jeopardize the delivery of completed project and pressure a contractor to make many claims. Extremely high estimates may affect the project approval process. Research indicates people like to use low estimates initially.
5	Procurement Process	Ensure a fair and transparent process that is auditable and makes sense	This is a mega project worth many millions and the pressures to award will be great. The GNWT/DOT need to be extremely careful in ensuring an approved process is agreed to early in the project life and there is a clear and auditable trail for decision making and awarding work. Initial steps may lead to other decisions or force decisions which must be avoided.	DOT	4	5	20	The Project team and various Departments involved needs to articulate a process and timetable as soon as possible. There will be pressure to keep the work in the region and to also spread around the NWT. Alliance model or Early Contractor Involvement models can be used. Recent negotiated contract for source 177 had significant local involvement.	The project could get mired into a difficult and protracted process that detracts from the actual work. Lessons learned from other projects must be reviewed. There are many examples from other provinces/territories that could be used as a model.
6	Legal	Claims	As a complex and multiyear project, early legal advice must be sought to ensure DOT avoids costly claims, law suits and other complex legal issues.	DOT	2	4	8	DOJ has been involved and will continue to monitor the project.	Depending on the procurement option the legal issues could be extremely complex or simple. A robust documentation control must be used.
7	Project Schedule Possible Delays	Delays and Claims	The project schedule will include a timetable for: planning, design, permitting, procurement and construction. Contractors will lease/purchase equipment and delays may cause equipment to stand still. Opening the Hwy is not tied to any specific date such as a major bridge. Delays for the GNWT are not a huge issue.	DOT	3	5	15	Have a clear project schedule and logistics supply plan with enough time to do all the key steps. Depending on the construction contract the contractor may take the risk on the construction.	Permitting, weather, geotech, design decisions, logistics and production rates will all impact the schedule.
Design and Technical									
8	Design and pre-engineering	Need to undertake all the proper	The project to be designed using current codes, standards and practices. Design build/P3 model may accelerate the project	DOT GNWT	4	4	16	Efforts must be made to ensure all the relevant information is available before key decisions are made (current geotech	Decisions made with erroneous data or poor assumptions will add unnecessary risks. Poor design or

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
	Works	design steps and site investigations	completion. Missing a key step or rushing a process may add significant risk					program) . Poor information will lead to significant errors in planning, cost estimates and budgets and increase risk.	lack of information may increase the O & M costs in the life cycle of the infrastructure.
9	Design Team experience and depth of knowledge	Team depth and capacity to respond	The GNWT must ensure the technical Design Team is capable and has the necessary depth of resources to carry this project to completion and can react to all the project requirements. Any contractor or JV must have a high capacity team.	D DOT GNWT	3	3	9	Ensure the Design Team has the necessary backup to deal with issues to include RFIs and technical questions. Track the exact timeline of all questions and responses. Contractor must also be fully capable to deal with issues in the field as well. Design team and owner must work in conjunction.	Any lack of depth and or experience may cause added costs or construction risks.
Regulatory and Process Risks									
10	Project Approval Process	Ensure project is properly approved by the various regulatory agencies	This is a complex project involving EIRB, Water Boards, Feds, local boards, all have their own process and all produce reports and recommendations. The DOT must ensure approvals are not given with a long list of restrictions which may be impossible to comply with.	DOT GNWT	2	5	10	Ensuring the proper information is provided to the various agencies. Ensuring the DOT is aware of the recommendations and any restrictions and all "knock on" effects are assessed.	Significant Oand M costs or very restrictive construction costs could be added to the project. All those involved need to be aware of the whole picture.
11	Skilled Labour	Lack of Skilled Labour	The Contractor will require skilled labour (mechanics, welders, carpenters, heavy equipment operators, surveyors, techs, engineers) for this project. Failure to secure and retain skilled labour reduces productivity. This is a 5-6 year project that will be in direct competition with our projects.	Contractor GNWT	2	3	6	The Project Manager may facilitate an attraction plan by linking the Contractor with other Ministries involved in the training (ECE). While attraction and recruitment is primarily a contractor responsibility, the Government can offer assistance in shaping a training program/plan. It should leverage GNWT Department of Education, Culture and Employment programs. This has commenced with ECE and Aurora College.	It is in GNWT best interest to see the successful attraction of both skilled and semi-skilled labour to the project. Where it is practicable, Contractors should be encouraged to hire locally and offer employment to graduates of GNWT Department of Education, Culture and Employment certified apprenticeship programs such as Aurora College – School of Trades, Apprenticeship and Industrial Training.
12	Promoting local and Aboriginal Employment	GNWT Non-Compliance with Policy	Government Projects must reflect its policies regarding the promotion of employment among aboriginal peoples. Failure to do so brings a lack of confidence and public censure with the potential for litigation.	Contractor GNWT	3	3		The Project Manager will facilitate linking the Contractor with the Ministry of Aboriginal Affairs and Inter-Government Relations to ensure understanding of and compliance with these policies.	The intent is to demonstrate the GNWT is actively encouraging Contractors to support its policy of Aboriginal Affirmative Action. See serial 11.
13	Permits	Permits must be secured and remain valid	Permit Control can be problematic. Given the expected duration of the project there is risk of either permits not being secured in time; or, equally troublesome, permits expire before work is completed.	Contractor	3	4	12	Project Manager to be responsible to maintain a Permit Register, identify permit requirements and coordinate permits. A regulatory Road Map is being developed and should be ready 1 June 2013 in	Project Manager to regularly review Permit Register and commitments.

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
								consultation with ILA, AANDC, NWTTWB and others.	
Construction Risks									
14	Project Management	Delay, claims geotech risk and engineering risks	The Project Manager must have the necessary resources (people and processes) to be able to properly manage this $299 m project. This is a large and complex project that requires a high skill level and expertise to successfully manage and execute. Contracts, payments, planning, detailed scheduling, accounting, quality assurance and proper on site leadership are all functions that must take place to effectively execute this project. We need to ensure that GNWT has adequate resources and the time to handle these issues.	DOT GNWT	3	5	15	Ensure a Risk Analysis is conducted for each new company/team added to the Project and review work progress and quality of existing team. Ensure the proper staff and processes are in place and the key functions have enough depth to deal with a number of issues at the same time. Constantly review the organization and conduct post activity reviews to ensure all is being done to ensure success. This includes weekly updates.	Claims, time delays, court action, legal issues and cost overruns could occur. Work to be redone. Work delayed due to capacity issues. Quality issues arise. Public confidence would be affected.
15	Project Oversight and Quality Assurance	Project Risks	Project oversight committee to oversee the project at all stages. In case of P3 project delivery, the Concession Agreement to be drafted with complete risk assessment, risk mitigation and risk sharing aspects. For a standard construction contract late completion, poor quality and not performing to the permits need to be laid out.	DOT GNWT	3	5	15	Ensure the proper staff and processes are in place and the key functions have enough depth to deal with a number of issues at the same time. Constantly review the organization and conduct post activity reviews to ensure all is being done to ensure success. Respond quickly to the issues and ensure risks are eliminated or mitigated or clear understanding of risk sharing.	Significant political and financial impact if project goes astray due to lack of oversight. Public Confidence eroded. Media interest extreme.
16	Changes during Construction	Change Orders increase Time and Costs	Changes to design creates change orders which bring either delays or added costs.	GNWT	5	4	**20**	Comprehensive Design Review is critical to ensuring a consistent construction plan. A defined control and approval process for change orders should be implemented.	Change Order approvals must be reviewed expeditiously so that construction work is not impeded or delayed awaiting decisions. Project Manager may require the services of a qualified consultant (with the experience on similar projects) to vet change orders.
17	Project Oversight	Project Manager`s Time is spread among several competing	Lack of oversight may cause problems that come to have major consequences	DOT GNWT	1	2	**2**	Single project Project Manager assigned permitting him/her to dedicate their full attention. FMB/DMsand ITH Oversight committee to provide oversight.	Coordination of the oversight will need to be done to ensure effective use of the various committees.

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
		projects							
Technical and Environmental Risks (Climate Change, Permafrost)									
18	Environmental Reviews and Approvals	Environmental restrictions or new conditions add to costs	An Environmental Impact Study will support the construction project but will establish conditions, cautions and restrictions regarding construction. There is risk that these conditions could be misunderstood (and therefore violated) by the contractor; or, the Minister of Environment may submit addendums with further construction restrictions. In the first case, the contractor would risk penalties that could include dismantling or redoing work and incurring delays.	DOT GNWT	2	5	10	Ministry of Environment to be engaged in Risk Management Process. Both the Project Manager and the Contractors will review all environmental studies and conditions to ensure clarity and resp. Review will include highlighting of sensitive areas such as waterways, wildlife sanctuaries and no go areas along each phase of the route.	The EIRB is complete and has 44 recommendations. These need to be reviewed along with all the commitments to ensure the GNWT has not committed to something that has cost implications. We await the federal response.
19	Work Spread Sites and Environmental Impacts	Operating Practises at Spread Sites cited for environmental infractions	Ministry of Environment has stringent rules and regulations regarding camp operations and equipment sites. Violations frequently result in fines (contractor responsibility) or shut down/close orders. In the latter this delays project and could seriously jeopardize work on road construction	Contractor DOT GNWT	2	4	8	Before any spread site, staging camp or equipment fleet site is established, the Contractor will brief the Project Manager on the site location, concentration of personnel & equipment, and review the Health, Safety and Environmental Protection measures that will be in place. The Project Manager will confirm that the Contractor will be in compliance. Project Manager is to be on distribution for all cited infractions which will serve as an indicator of compliance	Recent inspections by ILA and WSCC of the source 177 work indicated no major issues.
20	Intervention of Special Interest Groups/ Environment Lobby Groups	Agitation and confrontation impacting the Project	The Arctic is a sensitive area with local, national and global communities claiming oversight. All will have an opinion on the practises of the contractor and the GNWT regarding environmental stewardship. Infractions and either perceived or confirmed misuse or abuse will negatively impact reputations of both the government and the contractors. This will invite even greater regulatory oversight with the attendant demands for changes to construction. Equally important, should the project fall into disfavour with the public (both Territorial constituents and those	Contractor GNWT	2	4	8	The Project Team will develop a Communications Strategy that showcases the GNWT commitment to the environment and the regulatory regulations to be followed. The environment will be an identifiable and separate agenda at all Risk Management Reviews. The Communications Plan will include concrete measures to the project's management as evidence that it is a strong environmental steward. Implementation of the ITH Corridor Working Group will serve as a forum for info exchange.	The impact of a poor report card regarding environmental stewardship is multi-facetted. Some consequences will be obvious such as fines and re-construct or redo orders. Others may be indirect but no less painful for both the Government and the Contractor and could include: • Reluctance of financial institutions to lend to the contractor • Reduced public support for the Government because of an eroded confidence in its

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
			external to the NWT) it could jaundice future projects						• environmental protection practises • Greater intervention of Environmental Advocacy Groups • A reluctance of sub-contractors to engage in this project
21	Environment - Wildlife	Barriers to Wildlife	Wildlife migration patterns are disrupted resulting in government intervention, project delays and change orders with increased costs	Contractor GNWT	3	4	12	Review Environmental Impact Study. Ensure route design avoids sensitive areas. Build wildlife overpass/underpass facilities to ensure wildlife migration routes are respected	The global litmus test for an environmentally conscious public is the construction project's direct and indirect disruptions to wildlife habitat. The GNWT aim is to have demonstrable measures that safeguard both These measures are to be included in the Project`s Communication Plan.
22	Environment - Noise	Unanticipated Noise Impacts	High decibel or extended exposure to medium decibel noise affects both the public and wildlife Blasting could be problematic, affecting both humans and wildlife. If not rigidly controlled it could result in public enmity.	Contractor	1	2	2	Noise discipline practises to be enforced. Confirm blasting plan and communicate it to both the public and the Government. DOT to facilitate this understanding with other Government Departments	Review the commitments made on this issue to ensure in compliance.
23	Environment – Water Usage	Exceeding Water Limits	Water use will be closely monitored to ensure the ecological balance and issues permits to draw water from natural sources with strict quantifiable limits. This will apply to winter works, camps and compaction. Exceeding water limits risks fines, shut down orders and public censure.	Contractor	1	4	4	Ensure permit limits are respected. Violations monitored by both legal authorities and the public. Closely monitor the water useage.	Impact could be significant due to sensitive nature.
24	Climate Change and Weather issues	Ice Road and Barge operations and capacities as well as work delays and stoppages	Risk of road and barge operations commencing later and closing earlier. Risk of lack of transport capacity to deliver materials to the job sites. Staff work in inclement weather with: • Reduce productivity • Spread of disease and illness	Contractor Sub-Contractors Project Manager	4	4	16	Related to other serials concerning logistics and monitoring. DOT and Contractors will communicate on the status of the transportation links.	Climate change can sometimes be more dramatic in the arctic and will need to be assessed.
25	Difficult Permafrost	Road and Bridge	Road and bridge building in permafrost is technically challenging and must be properly	DOT GNWT	4	5	20	The Design team (using experts such as Don Haley) and to use all available tools and	Increased costs/km of road. Damage to the area. Increased maintenance,

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
	Region including ice polygons	building in difficult terrain /permafrost to be considered during design and planning	designed and controlled. This is a design challenge to build a road that is sustainable in the permafrost region without jeopardizing permafrost conditions or incurring major OandM costs.					information to make sure road design will be effective in the environmental conditions. A short test section has been constructed to confirm design issues and test proposed insulated areas. The QC and QA teams to ensure on site practices are being strictly adhered too.	operation and lifecycle costs
Quality Control and Quality Assurance Risks									
26	QA/QC All Special Advisors	Not completing the required due diligence	QC/QA team ensure all design and construction meet exacting standards. The Project places significant trust in and relies upon the work and recommendations of various experts and consultants involved.	DOT GNWT	3	4	12	Qualified companies and personnel who have the knowledge and experience to add value to the project are doing this work. Proper processes are in place to ensure the work is complete and proper checklists or procedures are in place and nothing is over looked or missed.	Redoing major components of the project. Court action. Loss of public confidence. Safety issue
General Risks									
27	Public Confidence Media	The public see this project in many different ways. Public confidence is important for the project.	Lack of good and timely communications and spreading of rumours may lead to the public lacking confidence in the Project. The Procurement process must be transparent and accountable to the public.	DOT GNWT	3	5	15	Concentrate on good communications and excellent coordination. Clear communications plan in place prior to any work commencing. Establishment of Project Offices in Tuk and information offices in Tuk and Inuvik through the GSO will assist in passing key messages.	Poor press and a lack of communication will impact the project with added distractions. Develop a web site and Communications plan that: • Notifies the Public • Health & Safety tips • Progress and Milestone Achievements
28	Political Risks	Political Influence	There may be opportunities for decisions to be influenced through the political process	DOT GNWT	3	5	15	A clear and concise process for decisions and procurement are developed using the best practises for PM	PM team to be fully aware of all the issues and the impact of decisions.
Supply Chain Risks									
29	QA/QC against Inferior Materials	Inferior Materials are not to of sufficient quality	Use of Inferior materials (geotextile, bridge materials) risks the integrity of the construction and places public at risk. Delays and increased costs (both time and money) to reorder/reship materials and redo construction.	Contractor DOT GNWT	2	4	8	Establish product specifications and procure from reputable suppliers with experience in providing to the North Establish stringent quality assurance/ quality Control measures that include inspections and testing before products leave manufacturer and on receipt and installation.	Gravel for base is quarried in region, surface gravel is not. Almost all other materials and products must be imported from the South (rail/road to Hay River then ice road/river barge to Inuvik.
30	Scarce	Resources and	Pre-fabricated steel products, attachments,	Contractor	2	3	6	Project Manager to determine materials	

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
	Resources	products not available	culverts and other materials required for road and bridge construction may be in short supply – creating delays in construction	DOT GNWT				specification early and share supplier information Integrated Team to conduct a staff check of availability and lead times. Integrated Team to host a transportation working group with ground and barge service providers to confirm capacity Finalize schedule and order materials well in advance of requirement	
31	Material Price Escalation	Increased Costs	Prices may escalate over time or due to scarcity.	Contractor	5	4	20	Negotiate Fixed Price Contracts early. To do so the Project Manager will provide a comprehensive schedule.	
32	Projects in Competition	Equipment and Material Scarcity	There are numerous projects (Oil and Gas drilling, communications cable and tower construction, urban development, infrastructure improvements and DND runway extension) all competing for materials, leased equipment and cargo capacity to bring it forward on rail (to Hay River) barge or ground transport. Risk this Project may suffer lack of availability of material and equipment resulting in delays	Contractor GNWT	3	5	15	Finalize Work Schedule and build in flexibility with road construction such that if materials or equipment is not available at one job site, switch priority to other sites. Consider pre-positioning quantities of material in advance of need. Impact of DND runway ext project in Inuvik unknown at this time- but assessed as likely to be outside current ITH construction window.	DOT needs to assess the impact of all other works in the region.
Financial Risks									
33	Project Funding	Project is fully funded jointly by Federal Gov and GNWT	Project funding based on early estimates. To date Feds commit to $200m and the GNWT to $99m. Cost overruns are the GNWT responsibility.	Contractor DOT, GNWT	3	4	12	Obtain as much info as possible to assist in the design and cost estimates. Current estimates based on 85% design and preliminary geotech results. By fall 2013 the DOT will have more info to refine cost estimates and contingencies.	Dot will need to closely monitor the budget and contract prices. Good experience gained through the source 177 project. Bonding and securities to be in place to protect the project.
34	Compatibility of Payment Schedule linked	Contractor has Cash Flow Problems and	The Contractor must pay out large sums to secure labour, materials and transport for delivery to spread sites.	Contractor DOT GNWT	3	5	15	DOT to develop a complete understanding of the Contractor's Concept of Construction and the Project Manager's work and	While there is always some conflict between the Contractor who wants payment early and often as opposed

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
	to Work Progress	fails to meet payroll and pay suppliers.	Insufficient cash flow could result in skilled labour quitting and suppliers and service providers refusing service or litigation Worse Case – Contractor becomes insolvent and project is jeopardized					payment schedules.	to the Government who must exercise probity and due diligence and therefore only wishes to pay for (verifiably) completed work – achieving a balance requires a collegial resolution.
35	Insolvency	Contractor Enters Bankruptcy Protection	Contractor becomes insolvent with risk that he ceases work and creditors cease materials, plant and equipment.	Contractor GNWT	1	5	5	Organize the construction process such that it is a series of stand-alone projects with achievable milestones. Develop a reasonable payment schedule and ensure prompt payment (See serial 34)	Bankruptcy affects reputation of Government and Contractor.
Health and Safety Risks									
36	Labour	Health and Safety Programs	The job sites incur a high incidence of accidents resulting in lost time, fines and the potential for criminal charges. Specific injuries could be attributable to: • Failure to wear Personal Protective Equipment • Preventable Vehicle and Earth Moving Equipment Accidents • Over exposure to the elements • Unsafe movement around water • Failure to install guards, barriers or hazard notices • Improper Storage of Hazardous Materials • Failure to protect the public from exposure to unsafe conditions	Contractor Sub Contractors GNWT	5	3	15	Integrated Team to collegially develop a Project Health and Safety Program which will include formal training. All hired trades must have current certifications for handling of equipment and execution of duties. Recent source 177 project did note no major concerns with this area.	Studies indicate Health and Safety issues are the 4th Greatest Risk in the Construction industry. Workmen's compensation claims are increasing while Sureties demand higher premiums and scrutinize claims.
37	Public Health and Safety	Public Exposed to Job Site Hazards	Risk of irritation/injury from roads not marked/barricaded close to public, unprepared for blasting, vehicle accidents from movement of oversized equipment.	Contractor DOT GNWT	2	2	4	Integrated Team to publish and place notifications with radio and on web site. Working with co-mgt groups and various hunters groups will assist in this. Establishment of the ITH working group will serve as a forum for info exchange.	
Culture and Heritage									

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
38	Impacts on Traditional Hunting and Fishing	Violation of Public Trust/Change Order Risks	Public surveys demonstrates there is support for the Road but conditional on there is to be no disruption to bear and carnivore denning, bird and fish breeding grounds or the migratory routes of bison and caribou. No all wildlife sanctuaries are known but as they are discovered, the conditions must be respected and change orders affected to by-pass these sensitive areas.	Contractor Sub Contractors DOT, GNWT	4	4	16	Crews must be educated for signs of these sensitive areas, note them and advise of the need for variations. Staff working on the road's construction must be trained to recognize and respect wildlife sensitive areas. Publicize Project efforts regarding respect for Inuit culture on web site. Working with co-mgt groups and various hunters groups will assist in this. Establishment of the ITH working group will also serve as a forum for info exchange.	Could result in stop work orders or delays in the project as mitigation plans are developed.
39	Archaeological Discoveries	Change Order Risks	There are known archaeological sites within the area through which the road will pass. Inevitably, other sites of archaeological significance will be discovered. These must be by-passed and the road re-routed. Risk of increased costs to address variations. Potential risk of Public dissent should violations occur. High risk of this occurring because staff and construction crews do not have the technical knowledge to interpret a site of archaeological significance.	Contractor Sub Contractors DOT, GNWT	4	3	9	Seek professional assistance in recognizing these sites such as the PWNHC. Establish a protocol to investigate. Train and educate crews. Experience with source 177 has shown local contractors can work successfully with PWNHC.	Indigenous people hold their heritage close to their hearts. There is a resurgent interest in history and these archaeological finds are a link to the past. Violations may be seen as a blatant disregard for heritage and can become a major issue.

APPENDIX D: Questionnaire

QUESTIONNAIRE FORM TO EVALUATE RISK ASSESSMENT AND ALTERNATIVE DISPUTE RESOLUTION PRACTICES IN INFRASTRUCTURE PROJECT INVESTMENTS

The purpose of the questionnaire is to search of the construction companies' risk assessment of contractual practices in infrastructure project investments. Moreover, the effect of **Alternative Dispute Resolution Methods** on those risks are going to be investigated.

The information you share with us will be confidential and will be kept in that way. In order to prevent any setback, we kindly request you to answer the form **until 15 April 2015.**

This research has been carried out by ITU Civil engineering Department faculty member Assistant Professor Dr. Pelin ALPKÖKİN, Dr. Nurbanu ÇALIŞKAN and MSc student Furkan ÖZBEY. Feel free to contact with us about your questions and opinions about questionnaire from the contact information below.

Regards,

Asst. Prof. Pelin ALPKÖKİN (alpkokinp@itu.edu.tr)
Dr. Nurbanu ÇALIŞKAN (caliskannur@itu.edu.tr)
Furkan ÖZBEY (furkanozbey@yandex.com)

Company Name

Questionnaire Participant Name

Position in the Company

Phone and E-mail Address:

*The information that requested from you is for possible errors that about questionnaire. All information taken will be kept hidden. However, you may skip this section if you do not wish to fill out.

CHAPTER 1: COMPANY PROFILE

1) How many years has your company been active in:

Construction Industry: ……..years

Construction Design and/or Consultant ……..years

1.1) Your Personal total experience in construction industry:……years

2) Please indicate your 2014 revenue ……. USD

3)If the company has infrastructure projects in the areas written below; please specify the revenue distribution among them

Turkey: ……..%
Middle East and Arabic Countries:……..%
Commonwealth of Independent States Countries:…… ……..%
North African Countries:……..%
European Countries:……..%
Other (Please Specify):……..: ……..%

4) Please show the companies' working fields and specify the revenue distribution or number of projects for each field in the last five years .

Highway:…….

Airport:…….

Bridge:…….

Railway:…….

Tunnel:…….

Urban rail systems:…….

CHAPTER 2: RISK ASSESSMENT

5) What are the possibilities and impacts of design relevant risks which are mentioned below? What are the Alternative Dispute Resolution (ADR)effects about those risks?

Possibility	**(1: never 2:rarely 3:sometimes 4:usually 5:always)**
Risk Impact	**(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**
ADR Effect	**(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**

Risks	Possibility	Impact	ADR Effect
Inadequacy of project site investigation			
Detailed design issue delays by the Employer (in case design responsibility is not with the construction company)			
Detailed design approval delays (in case design responsibility is with the construction company)			
Design and construction standard changes during construction period			
As-built design delays			
Defective design			

6) What are the possibilities and impacts of site relevant risks which are mentioned below? What are the Alternative Dispute Resolution (ADR) effects about those risks?

Possibility	**(1: never 2:rarely 3:sometimes 4:usually 5:always)**
Risk Impact	**(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**
ADR Effect	**(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**

Risks	Possibility	Impact	ADR Effect
Expropriation delays by the Employer and problems			
Additional expropriation delays by the Employer for permanent purposes for project			
Site handover problems by the Employer for temporary construction purposes			
Relocation of municipal services i.e. utilities (pipelines, electrical lines etc.)			
Lack of information about existing site conditions			
Conditions /defects of existing buildings (within the Site and around the Site)			
Archaeological findings			
Construction activity that results in contamination (chemicals mix drainage water, using large quantities of grouting agent etc.)			

Road Access (for local road or worksite access) and temporary traffic diversions			
Site Safety (HSE)			

7) What are the possibilities and impacts of <u>construction risks</u> which are mentioned below? What are the Alternative Dispute Resolution (ADR) effects about those risks?

Possibility	**(1: never 2:rarely 3:sometimes 4:usually 5:always)**
Risk Impact	**(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**
ADR Effect	**(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**

Risks	Possibility	Impact	ADR Effect
Differing geotechnical conditions (ground characterization, complex and unpredictable ground conditions, measurement problems in rock)			
Measurement problems related to ground water level			
Supply of material and equipment availability			
Difficulty to obtain Excavated Material disposal area			
Skilled workforce unavailability			
Delay caused by third parties (permits & approvals)			
Project management/interface delays (with Third Parties)			
Changes (Variations) in scope of Work by owner			
Construction/ Design changes (variations) by the Employer			
Construction acceleration (by the owner, government pressure etc.)			
Inadequate and improper insurance			
Subcontractor problems (inadequency etc.)			
Site health and safety			
Disputes between designer/contractor/professional team			
Adverse weather conditions			
Force majeure (war, earthquake flood etc.)			

8) What are the possibilities and impacts of <u>financial risks</u> which are mentioned below? What are the Alternative Dispute Resolution (ADR) effect about those risks?

Possibility **(1: never 2:rarely 3:sometimes 4:usually 5:always)**

Risk Impact **(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**

ADR Effect **(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**

Risks	Possibility	Impact	ADR Effect
High inflation			
Delayed payments (cash flow problems)			
Fluctuation in material and equipment prices			
Fluctuation in labour prices			

9) What are the possibilities and impacts of <u>Permit and Approval risks</u> which are mentioned below? What are the Alternative Dispute Resolution (ADR) effect about those risks?

Possibility **(1: never 2:rarely 3:sometimes 4:usually 5:always)**

Risk Impact **(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**

ADR Effect **(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**

Risks	Possibility	Impact	ADR Effect
Municipal Approvals			
Complexities of administrative structures			
Inexperience of administrative personnel			
Delay in approval from regular bodies			

10) What are the possibilities and impacts of <u>contractual risks</u> which are mentioned below? What are the Alternative Dispute Resolution (ADR) effect about those risks?

Possibility **(1: never 2:rarely 3:sometimes 4:usually 5:always)**

Risk Impact **(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**

ADR Effect **(1:ineffective 2:less effective 3:average effective 4:effective 5:very effective)**

Risks	Possibility	Impact	ADR Effect
Ambiguities in conditions of contract			
Disagreement on interpretation of conditions of contract			
Client's excessive demands and variations			

CHAPTER 3: DISPUTE RESOLUTION

11) How often does your company use the contract types written below? (Please skip the types that is not used) (1: very rarely 2: rarely 3:sometimes 4:often 5:usually)

Public Procurement Law	1	2	3	4	5
Municipality Contracts	1	2	3	4	5
FIDIC Standard Contract Types	1	2	3	4	5
World Bank Standard Contract Types	1	2	3	4	5
AIA Standard Contract Types	1	2	3	4	5
Private Contracts prepared by parties	1	2	3	4	5
Other (Please specify)	1	2	3	4	5

12) How much does the unsettled / ongoing disputes affect the below issues (1: very rarely 2: rarely 3:sometimes 4:often 5:usually)

Increase in cost	1	2	3	4	5
Construction schedule delay	1	2	3	4	5
Decrease in construction quality	1	2	3	4	5
Company reputation damage	1	2	3	4	5

13) How often does your company use the below stated dispute resolution types* ? (Please skip the types that are not used) (1: very rarely 2: rarely 3:sometimes 4:often 5:usually)
*** Please find dispute resolution types are listed and explained at the end of the questionnaire)**

Litigation	1	2	3	4	5
Arbitration	1	2	3	4	5
Dispute Adjudication/Resolution Boards (DAB/DRB)	1	2	3	4	5
Adjudication	1	2	3	4	5
Expert Fact Finding/Appraisal	1	2	3	4	5
Executive tribunal	1	2	3	4	5
Mediation	1	2	3	4	5
Negotiation	1	2	3	4	5
Other (please specify): ……..…….					

14) Please specify the performances of the below stated dispute resolution types (Please skip the types that are not used) (1: very rarely 2: rarely 3:sometimes 4:often 5:usually)

Litigation	1	2	3	4	5
Arbitration	1	2	3	4	5

Dispute Adjudication/Resolution Boards (DAB/DRB)	1	2	3	4	5
Adjudication	1	2	3	4	5
Expert Fact Finding/Appraisal	1	2	3	4	5
Executive tribunal	1	2	3	4	5
Mediation	1	2	3	4	5
Negotiation	1	2	3	4	5

15) Do you consider to use <u>ALTERNATIVE(other than litigation and arbitrating) dispute resolution types</u>) (Which are DAB/DRB, adjudication, Expert fact finding/appraisal, executive tribunal, mediation, negotiation) in the future?

……. Yes/No

16) Please specify the reasons for your company to prefer <u>ALTERNATIVE (other than litigation and arbitration)</u> dispute resolution types now or future? (1: very rarely 2: rarely 3:sometimes 4:often 5:usually)

These types lower the costs of dispute resolution process	1	2	3	4	5
These types accelerate the duration of dispute resolution process	1	2	3	4	5
These types protect the boundaries between parties	1	2	3	4	5
Simplicity to use these types	1	2	3	4	5
These types create an opportunity to settle the dispute with experienced and neutral individuals	1	2	3	4	5
These types give right to reject the experienced and neutral individual	1	2	3	4	5
These types keep the information and documents classified	1	2	3	4	5
These types let spare time for dispute resolution to upper management of the parties	1	2	3	4	5
Process of these methods are flexible and they are under control of parties	1	2	3	4	5
These methods increase the reconciliation between parties	1	2	3	4	5
These methods increase probability to satisfy parties commercially	1	2	3	4	5
These methods are suitable for multilateral dispute resolution	1	2	3	4	5
These methods lower the need of legal adviser/lawyers	1	2	3	4	5

Avoidance of the local courts or arbitration due to lack knowledge of legislation in project's country	1	2	3	4	5
Avoidance of the local courts or arbitration due to lack of documentation of dispute	1	2	3	4	5
Dispute comprise from technical issues	1	2	3	4	5
Other (please specify) : …….……..					

17) Please specify the reasons for your company NOT to prefer <u>ALTERNATIVE (other than litigation and arbitration</u>) dispute resolution types now or future? (1: very rarely 2: rarely 3:sometimes 4:often 5:usually)

Lack of information and education about these methods	1	2	3	4	5
These methods are not known enough in the construction industry	1	2	3	4	5
Slowness of the adaptation of innovative practices	1	2	3	4	5
Lack of institutionalization and corporate infrastructure about these methods (unfeasibility of corporation and consultancy services)	1	2	3	4	5
Concern about the effectiveness of these methods	1	2	3	4	5
Thought of inefficiency of non bounding (consensual) methods	1	2	3	4	5
Concern about the performability of the results by the result of these methods	1	2	3	4	5
Fear of the reason of usage of these methods as a tactic to delay payments	1	2	3	4	5
Dispute involves legal issues	1	2	3	4	5
Problems about communication with other party	1	2	3	4	5
Other (please specify): ……					

DISPUTE RESOLUTION TYPES THAT ARE USED IN QUESTIONNAIRE

1. Litigation is a dispute resolution institution which prosecutes in behalf of state
2. Arbitration is an alternative to litigation. Instead of state judges, private arbitrator is used. In this method, parties can choose the trial process, provisions of laws and standards that are going to be used.

3. Dispute Adjudication/Resolution Boards, consist of expert persons who are selected from the beginning of the project and they guide parties in potential dispute subjects. If any dispute arises, parties consult to board. Then, board states their decision. If parties does not object within a specified time, the decision may be binding.
4. Adjudication, is a method to settle the dispute by an adjudicator. In adjudication process, adjudicator decides the within a specified time. If parties does not object within specified time, decision becomes binding.
5. Expert Fact-Finding / Appraisal is a process includes neutral experts who tries to clear the disputed subjects for parties with his/her technical knowledge and experience. This process is used when the experts of the parties do not have the authority to give a decision or when parties require someone to monitor the process during negotiation process. Those expert's decision is not binding.

6. Executive Tribunal is method consist of a neutral moderator and executives of both parties. Those executives should not have involved the disputed subject before. Parties present their cases and executive tribunal tries to settle the issue. The moderator may suggest her/his opinion.

7. Mediation is a process that helps to identify the disputed subjects, find solutions and evaluate the alternatives. Mediator does not have any effect on the content of dispute or any influence to solve the dispute. Mediator can only give advice and decide procedure of the mediation process
8. Negotiation is a voluntary and non binding process to settle the dispute. Representatives of the parties try to resolve the dispute by themselves. This method takes less time, less people and strengthened relationship.

APPENDIX E: Reliability Analysis Results

- Design questions "Possibility" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	11	91,7
	Excluded[a]	1	8,3
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,928	7

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
DESQ1	16,3636	42,455	,874	,907
DESQ2	15,9091	40,491	,873	,908
DESQ3	16,2727	50,018	,843	,917
DESQ4	16,1818	47,764	,772	,918
DESQ5	16,2727	47,018	,749	,920
DESQ6	16,3636	49,055	,572	,937
DESQ7	16,0909	45,291	,830	,912

- Design questions "Impact" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	10	83,3
	Excluded[a]	2	16,7
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,692	7

Item Statistics

	Mean	Std. Deviation	N
DESQ1	4,3000	,82327	10
DESQ2	4,7000	,48305	10
DESQ3	3,9000	,56765	10
DESQ4	3,8000	,91894	10
DESQ5	3,5000	,97183	10
DESQ6	3,7000	1,05935	10
DESQ7	4,3000	,94868	10

- Design questions "ADR" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	10	83,3
	Excluded[a]	2	16,7
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,808	7

Item Statistics

	Mean	Std. Deviation	N
DESQ1	3,3000	1,33749	10
DESQ2	3,8000	,78881	10
DESQ3	3,8000	,63246	10
DESQ4	3,9000	,56765	10
DESQ5	3,9000	,56765	10
DESQ6	3,8000	,91894	10
DESQ7	3,8000	,78881	10

- Site questions "Probability" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,870	10

Item Statistics

	Mean	Std. Deviation	N
CONQ1	3,5833	1,16450	12
CONQ2	3,2500	1,05529	12
CONQ3	3,2500	1,05529	12
CONQ4	3,6667	1,15470	12
CONQ5	3,1667	1,19342	12
CONQ6	2,8333	1,11464	12
CONQ7	2,2500	,96531	12
CONQ8	2,5833	1,08362	12
CONQ9	3,1667	1,11464	12
CONQ10	2,7500	1,28806	12

- Site questions "Impact" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,691	10

Item Statistics

	Mean	Std. Deviation	N
CONQ1	4,5000	,90453	12
CONQ2	4,0000	1,20605	12
CONQ3	3,6667	,88763	12
CONQ4	3,9167	1,08362	12
CONQ5	3,5833	,79296	12
CONQ6	3,6667	,88763	12
CONQ7	4,0000	1,20605	12
CONQ8	3,4167	,99620	12
CONQ9	3,6667	1,07309	12
CONQ10	3,6667	1,23091	12

- Site questions "ADR" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,851	10

Item Statistics

	Mean	Std. Deviation	N
CONQ1	4,4167	,79296	12
CONQ2	4,5000	,67420	12
CONQ3	4,0000	,85280	12
CONQ4	3,5000	1,16775	12
CONQ5	3,6667	,77850	12
CONQ6	3,3333	1,15470	12
CONQ7	3,6667	1,30268	12
CONQ8	3,2500	,86603	12
CONQ9	3,5833	1,24011	12
CONQ10	3,5833	1,50504	12

- Construction questions "Probability" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	10	83,3
	Excluded[a]	2	16,7
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,953	16

Item Statistics

	Mean	Std. Deviation	N
CONQ1	3,0000	1,49071	10
CONQ2	3,1000	1,19722	10
CONQ3	2,8000	1,22927	10
CONQ4	3,2000	,91894	10
CONQ5	2,4000	1,34990	10
CONQ6	3,7000	,94868	10
CONQ7	3,2000	,78881	10
CONQ8	3,4000	1,26491	10
CONQ9	3,0000	1,24722	10
CONQ10	3,8000	1,03280	10
CONQ11	2,4000	,96609	10
CONQ12	3,1000	,99443	10
CONQ13	2,8000	1,22927	10
CONQ14	3,4000	,84327	10
CONQ15	2,7000	1,25167	10
CONQ16	2,0000	1,33333	10

- Construction questions "Impact" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	10	83,3
	Excluded[a]	2	16,7
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,756	16

Item Statistics

	Mean	Std. Deviation	N
CONQ1	4,1000	1,28668	10
CONQ2	3,9000	,73786	10
CONQ3	3,6000	,69921	10
CONQ4	3,5000	,84984	10
CONQ5	3,1000	,99443	10
CONQ6	4,1000	,87560	10
CONQ7	3,8000	,91894	10
CONQ8	4,0000	,81650	10
CONQ9	4,0000	1,05409	10
CONQ10	4,2000	,78881	10
CONQ11	3,6000	,84327	10
CONQ12	4,0000	,81650	10
CONQ13	4,1000	,99443	10
CONQ14	4,0000	,47140	10
CONQ15	2,8000	,78881	10
CONQ16	4,1000	1,28668	10

- Construction questions "ADR" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	10	83,3
	Excluded[a]	2	16,7
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,727	16

Item Statistics

	Mean	Std. Deviation	N
CONQ1	3,2000	1,13529	10
CONQ2	3,5000	,97183	10
CONQ3	3,0000	1,15470	10
CONQ4	3,8000	1,13529	10
CONQ5	2,6000	1,17379	10
CONQ6	3,9000	,73786	10
CONQ7	3,6000	,84327	10
CONQ8	4,0000	,81650	10
CONQ9	3,4000	1,26491	10
CONQ10	4,0000	1,05409	10
CONQ11	2,6000	1,07497	10
CONQ12	3,4000	1,07497	10
CONQ13	3,6000	1,26491	10
CONQ14	3,8000	,91894	10
CONQ15	3,0000	1,24722	10
CONQ16	3,2000	1,61933	10

- Financial risks questions "Probability" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,800	4

Item Statistics

	Mean	Std. Deviation	N
FINQ1	3,0000	1,04447	12
FINQ2	3,5833	,79296	12
FINQ3	3,5833	,79296	12
FINQ4	2,4167	,90034	12

- Financial risks questions "Impact" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,546	4

Item Statistics

	Mean	Std. Deviation	N
FINQ1	3,7500	,96531	12
FINQ2	4,1667	1,02986	12
FINQ3	3,8333	,71774	12
FINQ4	3,0000	,85280	12

- Financial risks questions "ADR" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,828	4

Item Statistics

	Mean	Std. Deviation	N
FINQ1	2,5000	1,38170	12
FINQ2	3,3333	1,49747	12
FINQ3	2,7500	1,21543	12
FINQ4	2,5000	1,16775	12

- Permit and approval risks questions "Possibility" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,841	4

Item Statistics

	Mean	Std. Deviation	N
PERQ1	3,5000	,90453	12
PERQ2	3,2500	1,13818	12
PERQ3	3,0833	1,16450	12
PERQ4	3,8333	,71774	12

- Permit and approval risks questions "Impact" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,836	4

Item Statistics

	Mean	Std. Deviation	N
PERQ1	3,8333	,93744	12
PERQ2	3,1667	,83485	12
PERQ3	3,5833	,79296	12
PERQ4	4,1667	,71774	12

- Permit and approval risks questions "ADR" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,823	4

Item Statistics

	Mean	Std. Deviation	N
PERQ1	3,5000	1,31426	12
PERQ2	3,0000	1,34840	12
PERQ3	2,9167	1,31137	12
PERQ4	3,7500	1,21543	12

- Contractual risks questions "Possibility" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,861	3

Item Statistics

	Mean	Std. Deviation	N
CONTQ1	3,0833	,99620	12
CONTQ2	3,3333	1,23091	12
CONTQ3	3,0833	1,08362	12

- Contractual risks questions "Impact" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,742	3

Item Statistics

	Mean	Std. Deviation	N
CONTQ1	3,5833	,90034	12
CONTQ2	3,6667	,77850	12
CONTQ3	3,2500	1,13818	12

- Contractual risks questions "ADR" section reliability analysis results

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,652	3

Item Statistics

	Mean	Std. Deviation	N
CONTQ1	3,2500	1,21543	12
CONTQ2	4,0000	1,04447	12
CONTQ3	3,0000	1,20605	12

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